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THE UNIVERSITY OF ALBERTA

THE RELATIONSHIP OF LANGUAGE AND COGNITION TO READING PROGRESS IN TWELVE DISABLED READERS

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled The Relationship of Language and Cognition to Reading Progress of Twelve Disabled Readers submitted by Stella Clarke in partial fulfillment of the requirements for the degree of Master of Education.

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ABSTRACT

The purpose of this study was to determine if the patterns of cognitive and linguistic learnings would explain the delay in reading progress experienced by disabled learners with at least average intelligence.

Twelve subjects were selected from three schools within the jurisdiction of the Edmonton Public School Board. All but two of the students were receiving reading remediation.

A series of linguistic and cognitive tasks were administered to each individual. The tasks included oral reading, storytelling, recognition and explanation of vocabulary, delineation of criterial attributes and recognition and explanation of conservation of quantity.

The findings revealed that these disabled readers made limited use of syntax and semantics in oral reading. In syntax dependency on the beginning of the sentence or the whole passage was evident while in the area of semantics they used the prior text or focused on word identification. Their quantity of vocabulary was adequate for their chronological age but it lacked quality. When identifying the physical world they depended on perceptual or functional features. Conservation of quantity was delayed one to two years, with scattered understanding among the levels of conservation, frequently supported by perceptually-bound answers.

From the results obtained in this study it appears that the delay in reading progress of these disabled readers is explained by a lag in the development of linguistic and cognitive skills. Functioning at an earlier level of development in these areas and unable to think

symbolically they cannot read at a level commensurate with their chronological age level. Further the acquisition of these skills seems to be fragmented rather than integrated and sequential.

It would appear that greater emphasis on the acquisition of oral facility, on depth and breadth in vocabulary growth, and finely analyzed sequential learning would assist such disabled learners to acquire and assimilate knowledge and facilitate their reading progress.

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CHAPTER I

THE PROBLEM

INTRODUCTION

With the explosion of information in today's world the ability to read becomes a valuable asset. This particular skill provides a means of acquiring information, knowledge and recreation.

Reading is one of the four modes of the communication process. With listening it constitutes the receptive skills, which are countered by the expressive skills, speaking and writing. Research has shown that proficiency in reading is usually preceded by competence in listening and speaking, and followed by the development of skill in writing (Dechant, 1970; Ruddell, 1974; Thorne, 1975; Wilkinson, 1971). All four avenues of communication form the components of the language arts program in the school system. They share the common element of language and are acquired behaviours.

For most of the school population the sequence of development in communication, and particularly in reading, proceeds automatically and without hindrance. However, in spite of seemingly well-structured programs and a variety of approaches there appears to be a segment of the population who are unable to progress as well as their peers. After 3 to 4 years in school, they are 1 to 2 years below their grade level in reading. Though there are no apparent physiological or mental handicaps, they have attained a plateau at the primary level from which they seem unable to move.

For these students the lack of progress in reading appears to be the result of a lag or deficit in both language and cognition (Cosens, 1974; Grant, 1965; Jackson, 1968; Rawson, 1969). The interrelationship of the two aspects is revealed by limited vocabulary, restricted concept formation, and a lack of verbal fluency found in the disabled children. Furthermore, they experience difficulty with increasingly complex syntax and in the transfer of learning.

BACKGROUND TO THE PROBLEM

When an individual approaches the reading task he must bring both language and experience to the code for the graphic symbol has no meaning in and of itself (Smith, 1971; Vygotsky, 1962).

In order to give meaning to the graphic symbol the reader must approach the visual stimuli in three different cognitive ways. First he has to identify the letters to determine the word, then relate the word to the semantic connections and associations. Finally he must comprehend the meaning of the word in that context through syntax and semantics. At each stage of reading categorization is demanded (Smith, 1971).

Prior to the reading task, each person has been constantly identifying objects and places as well as many aspects of his experience. Through the tool of vocabulary he labels, classifies and categorizes the physical world. Initially the word appears to be a property of the object rather than a symbol, and even later "the functional use of the new sign is preceded by a period of mastering the external structure" (Vygotsky, p. 50). Through such processes the individual acquires a repertoire of words which represent concepts or ideas.

Concept formation evolves in three major phases. The first is composed of completely unorganized categories—random or trial and error. This is followed by a syncretic stage in which organization is based upon the visual field providing for thinking in complexes, family names and pseudo-concepts. The final step is the formation of true concepts, evident when an individual considers at least two attributes at one time—for example, small and round (Ausubel, 1963; Vygotsky, 1962). Such concepts cannot be taught or drilled but occur when mental development has reached the requisite stage (Vygotsky, p. 82).

The formation of concepts and their modification are dependent upon the tool of language (Vygotsky, 1962; Wilkinson, 1971). It provides the avenue through which "the initial emergence of abstract meanings . . . [occurs] preceded by an adequate background of concrete-empirical experience" (Ausubel, p. 55). These abstract meanings in turn provide a framework for the reception of more potentially meaningful material, helping to create the "orienting action" (Evaneschko, 1970) or the "advanced organizers" (Ausubel, 1963) which facilitate continued learning, provided that successive contrasts between relevant and irrelevant criterial attributes are available.

Language is a behaviour specific to man which develops from generalized sounds to the particular intonation and rhythms, lexis and grammar of the community and society in which a person lives. The system within the verbal symbolic behaviour becomes automatic and assumes social and personal significance (Dechant, 1970). The behaviour is acquired, developed and maintained through dialogue with other human beings (Vygotsky, 1962; Wilkinson, 1971).

Concomitant with language growth is the individual's ability to learn and to know. Developmental changes in cognition become apparent for

> as children increase in age, they tend to perceive the stimulus world more in general, abstract, and categorical terms and less in tangible, time-bound, and particularized contexts; they demonstrate increasing ability to comprehend and manipulate abstract verbal symbols and relationships, and to employ abstract classificatory schemata; they are better able to understand ideational relationships without the benefit of direct, tangible experience, of concrete imagery, and of empirical exposure to numerous particular instances of a given concept or proposition; they tend more to infer the properties of objects from their class membership rather than from the direct experience of proximate, sensory data; they tend more to use remote and abstract than immediate and concrete criterial attributes in classifying phenomena, and to use abstract symbols rather than concrete imagery to represent emerging concepts; and they acquire an ever increasing repertoire of more inclusive and higher-order abstractions. (Ausubel, 1963, p. 111)

Such growth occurs as language and cognition mutually support each other, evolving into thought.

Thought development is determined largely by language (Vygotsky, p. 51), for "the relation of thought to word . . . [is] a process, a continual movement back and forth from thought to word and word to thought" (p. 125). Word meaning fuses into verbal thought, uniting the thought with speech (Vygotsky, 1962).

This development of thought may be hindered by inadequate identification and categorization of the physical world and experience. Labels may represent poorly formed concepts which in turn provide poor "orienting actions." Britton (1970) states:

> We cannot afford to underestimate the value of language as a means of organizing and consolidating our accumulated experience, or its value as a means of interacting with people and objects to create experience. (p. 279)

As in the process of thought it is necessary to command the external structure before use, so in the reading task the establishment of the identity of both concepts and code precedes functional use. It may be that the lack of clear identity in one or both of these aspects interferes with reading progress. Both are dependent upon language, experience and cognitive ability.

THE PURPOSE OF THE STUDY

The purpose of this study is to explore the learning patterns of twelve disabled readers to determine if a relationship exists between their language skill, cognitive ability and reading progress.

The specific intent in the oral reading task is an examination of the miscues in order to discover the nature of the errors and their relationship to the context.

Such miscues may reflect the individual's knowledge of language, so the level of maturity attained in expressive language is investigated by means of a storytelling task.

Expressive language is dependent upon an adequate repertoire of words, the symbolic representation of concepts. Therefore vocabulary is scrutinized for its quantity and quality.

Concepts are determined by the criterial attributes observed. The range and characteristics of the criterial attributes employed are classified through categorization of meanings.

Finally, the level of cognitive development is traced through the conservation of quantity, including conservation of substance, weight and volume. The level of growth is observed in both a concrete situation and an abstract framework.

Each area of growth is compared or correlated with the development that would be anticipated within that aspect of growth.

DEFINITION OF TERMS

Ability - basic mental capacity to perform a task.

Skill - an acquired capacity to perform a task.

Cue - a signal that leads to discrimination and/or meaning.

Miscue - mistake or error in which the observed response does not correspond with the expected response providing clues to the nature of the reading difficulty.

Distinctive features - the perceptual properties which distinguish one element or object from another.

T-unit - the minimal terminable unit which preserves all subordination and coordination between words, phrases and subclasses (Hunt, p. 21).

Normal reader - an individual who progresses at the anticipated rate in reading development.

Disabled reader - an individual whose reading performance does not appear to keep pace with his potential or anticipated rate of development.

Disabled learner - an individual who appears to have the competence to achieve academically but whose performance indicates a lack of progress, a synonym for disabled reader in this paper.

Retarded reader, Reading disabled, Reading handicapped } used interchangeably with disabled reader.

Reading retardation - a lag in ability to read.

Reading lag - synonym for reading retardation.

RESEARCH QUESTIONS

The investigation attempted to ascertain if there were any particular patterns of growth evident in the language and cognitive development of twelve disabled learners. At the time of the study all of the individuals in the sample were performing 1 to 2 years below their grade level in reading, though demonstrating adequate skill in other school subjects. Answers were sought to the following questions:

1. (a) To what extent are syntactic and semantic cues employed in the reading task?

(b) If these linguistic cues are utilized to what part of the context is reference made to aid word selection and meaning?

2. What linguistic competency is brought to the reading task as revealed in

(a) word production

(b) T-unit production

(c) general language development disclosed through the use of connectives, subordination and embedding?

3. How extensive is the vocabulary brought to the task?

(a) At what level is it understood?

(b) To what depth can it be explained?

4. Upon what criterial properties do the individuals depend in the process of identification and concept formation?

5. To what degree do these competencies reflect cognitive ability as revealed in the capacity to conserve, concretely and abstractly?

6. Is there a common pattern of growth apparent throughout the different areas and throughout the sample which would explain the apparent lag in reading skill?

LIMITATIONS OF THE STUDY

1. The small sample will necessitate caution in generalizing or extrapolating from the results since the study is limited to twelve learning disabled students.

2. Apart from specific criteria in selection there is no attempt to control for motivational level or attitudes of the subjects.

3. This study relates to a particular type of learner and the results cannot therefore be generalized to any child who has a reading problem.

ASSUMPTIONS

1. It is assumed that the instruments used will supply data relevant to the purpose of the study.

2. It is assumed that the information on potential for academic growth and on academic achievement obtained from educational histories contained in school records is reliable.

OVERVIEW OF PROCEDURE

A brief outline of the procedure used is given below.

The Sample

Twelve subjects were chosen to participate in this study from three elementary schools. All but two of the sample were receiving remediation, though reading retardation was evident in all cases.

Data Collection

The data were gathered by the researcher interviewing each subject individually. Each session was taped in order to verify the observations made during the interview.

Data Analysis

Three of the areas (criterial properties, vocabulary, storytelling) were analyzed according to procedures relevant to the tasks and as outlined below. The analysis was confirmed by the use of two independent judges, who met with the investigator to resolve disagreements.

In the remaining areas, oral reading and conservation, the analysis was completed by collaboration of the two judges with the investigator.

The miscues in oral reading were examined for both syntactic and semantic proximity as well as syntactic and semantic acceptability.

Responses for the conservation tasks were analyzed in two ways. First to see if conservation had taken place and secondly to determine if the explanation given was logical, perceptual or non-logical.

Criterial properties given by the sample were studied for their range and nature, according to the categories of meaning outlined by Siemens (1973) and Nixon (1976).

Spoken vocabulary was examined for the level of understanding and for depth in definition, the latter as established by Feiffel and Lorge (1950).

The storytelling task was analyzed for word production, T-unit length and general language development.

SIGNIFICANCE OF THE STUDY

If the present study reveals any particular pattern which demonstrates a relationship between cognitive ability, language and reading, it may be necessary to modify or restructure teaching procedures in order to facilitate further reading development by disabled readers.

The significance for the disabled learner would be that alternative approaches to learning might be developed which would improve his communication skills with increased independence and improved self-image.

For the teacher, it is hoped this additional information regarding the interrelationship of these skill areas with cognitive ability will reduce some current frustration and aid in developing an understanding of the limitations under which the disabled learner functions.

ORGANIZATION OF THE STUDY

The study will be presented as follows:

Chapter II. A Review of Related Research

This chapter includes a review of the characteristics of the disabled learner and the developmental patterns noted by research in the areas investigated in this study, namely, reading, language, vocabulary, criterial properties and conservation.

Chapter III. Design of the Study

This chapter contains the outline of the sample, the research instruments, the pilot study, data collection, data analysis and reliability of instruments and analysis.

Chapter IV. The Analysis and Findings of the Study

This chapter presents the analysis and findings concerning the development of the subjects in the areas of oral reading, language, vocabulary, criterial properties and cognition.

Chapter V. Summary, Conclusions, Educational Implications, Suggestions for Further Research

A summary of this study is presented together with the findings and conclusions drawn from the findings. The educational implications are discussed as well as further suggestions for research.

CHAPTER II

A REVIEW OF THE RESEARCH

In this chapter a review of the literature examines the characteristics of the disabled learner, processes involved in the reading task, the efficacy of language to the reading task, the development of language, vocabulary and its growth, the recognition of criterial properties and the acquisition of conservation.

THE DISABLED LEARNER

Within the educational system there is frequently found a student who appears to have the ability to read but who is unable to progress at the same developmental rate as his peers. Estimates in research indicate that in Western Civilization up to 25% (Klasen, 1972; Rabinovitch, 1968) of the school population may suffer from this debility, varying from a mild disorder to a very severe dysfunction. Certain characteristic discrepancies in growth are apparent, but these cannot be treated as rigid criteria since the cluster varies with each individual. In most cases interference with learning has taken place. Research on the disabilities reveals conflicting viewpoints as to their nature and their relationship to reading. However certain patterns in the growth of basic abilities do emerge.

One of the abilities believed to contribute to reading retardation is imprecise perception. Goins (1958) observed that the disabled reader appeared to have limited ways of "seeing," almost as though peripheral vision was not utilized. This disability would restrict the perceptual field, perhaps preventing the apprehension of the spatial relationships of objects and forms, as well as the perception of the relationships between them. Another researcher, de Hirsch (1966), claimed that the retarded readers had fragmented perception, which was poorly structured and unstable. More recently Klasen (1972) noted that perceptual disorders were high among this kind of reader. It would seem that these disorders tend to lead to a more diffuse general perception and the more diffusely an individual perceives the less distinctive become the forms or objects he observes. Consequently the individual is left with a vague awareness or very general classification (Vernon, 1952) rather than developing specific classification and categorization.

A specific aspect of perception has been noted as a contributing factor to reading retardation. Rabinovitch (1968) pinpointed figure-ground discrimination as a common deficiency in the retarded reader, though other researchers (Blank, 1972; Critchley, 1968; Goins, 1958) felt that such specific perceptual skills were not highly significant factors in their sample. Such specific perceptual limitations combined with the vague awareness noted earlier, may dispose the individual to delayed reading progress due to failure to distinguish one object from another or one form or detail from a similar one.

A particular deficit observed in children with a reading lag is the inability to communicate verbally (Blank, 1972; Critchley, 1968; de Hirsch, 1966; Naidoo, 1972; Rabinovitch, 1968). Communication involves both receptive and expressive language. Receptive language sometimes requires fine auditory discrimination as in raw/roar and lecture/election, combined with an understanding of how the structure of language cues meaning. In contrast, expressive language reveals the individual's ability to articulate and order spoken language. In each area the disabled reader tends to have difficulty, evident in the misinterpretation of what is said and in primitive sentence construction when he speaks (Critchley, 1968; de Hirsch, 1966; Naidoo, 1972; Shandling, 1970).

Through perception and language concepts are formed. The kind of concepts we develop are dependent upon what we perceive as the distinctive features, and should lead to classification and categorization of experience. The depth of such concepts depends upon acute awareness and the experience of the learner. When the perceptual awareness and expressive language are weak, imprecise concepts are likely to develop. The disabled learner is then restricted in his capacity to bring meaning to the encoded message whether in the spoken or printed word.

An important element of experience and language is order or sequence. The inability to sequence has been found to be a highly significant factor among the reading disabled (Kass, 1970; Naidoo, 1972; Rabinovitch, 1968; Shandling, 1970). Naidoo felt it could be an underlying disability in these individuals. Rugel (1954) using Bannatyne's reclassification of WISC subtest scores, appears to support her conclusion.

In an examination of the Relationship of Early Language

Development to Subsequent Reading Disorder, Kass (1970) points out the need to sequence in several aspects of the reading task. She found correlation with the reading process included grammar, visual sequencing, visual closure, prediction of the whole from part, blending of parts and ability to note likenesses and differences rapidly. Shandling (1970) observed this inability to order and co-ordinate several tasks which had to be performed simultaneously in quick succession. All of these aspects appear to require a sense of sequence with integration of information. Such tasks are poorly performed by the learning disabled.

Certain reading patterns are demonstrated by older disabled learners. Reading speed decreases and words are telescoped as letters are omitted. Errors are made inconsistently with the correct association of today being the error of tomorrow (Critchley, 1968; Miles, 1967). His total number of errors is greater than those of the normal reader (Klasen, 1972). In addition he is a poor spontaneous writer.

Characteristic attributes observed in the disabled reader include limited motility (de Hirsch, 1966; Naidoo, 1972), anxiety (Klasen, 1972) and poor self-esteem (Rosenthal, 1973). Such characteristics may develop because of the disability but can also become debilitating factors.

The patterns of growth and learning described above are more likely to be found in boys (Naidoo, 1972; Rabinovitch, 1968; Shandling, 1970), the defect demonstrating familial incidence (Critchley, 1968; Rabinovitch, 1968).

Having delineated the possible deficits of the disabled reader, it is also necessary to note he may not exhibit extreme emotional distress or severe mental retardation. His visual and auditory acuity appear to be intact. He has no speech problems and in a social situation is most unlikely to reveal any pronounced symptoms of his disability. His lack of verbal and organizational competency becomes more apparent when asked to do academically oriented tasks.

Continuing research into this type of reading retardation has constantly sought the "raison d'etre" of its existence. Current thinking seems to indicate a neurological involvement. This genetically determined disability appears to be "a specific cognitive dysfunction: an inability to organize graphic symbols to make sense" (Rosenthal, 1973). Critchley (1968) states, "the cerebral activity lags behind in maturation . . . a specific cognitive act in which symbols, auditory as well as visual, fail to achieve identity" (p. 78). "It is independent of intelligence and consequently it may appear in children of normal intelligence" (p. 18). It occurs across cultural and socio-economic groups (Klasen, 1972).

These students achieve adequately until they are dependent upon the maturation of cognitive and language skills. When these skills do not maintain the pace established by chronological or mental age, the students experience difficulty in the reading task.

PROCESSES INVOLVED IN THE READING TASK

Reading is the process of communication through the printed word. In order to adequately utilize the orthography of language it is essential that the individual be able to perform several specific tasks simultaneously. This has led to unending research into the process.

One of the earliest attempts to explain reading was by Gray (Williams, 1973, p. 124). His taxonomic model included four major areas. The first was word perception, which included both the pronunciation and determination of meaning. His second stage was comprehension, followed by reaction and evaluation, concluding with assimilation by the reader.

A more behavouristic model was presented by Gagné (1970). Since he viewed learning as a hierarchy of skills, he saw beginning reading through the mastery of pronunciation rules. Consequently he would begin with a firm knowledge of the single letters and sounds, followed by consonant and vowel combinations, leading to syllables and syllable strings, and finally to words. In later stages of reading he included the mastery of irregularities and the structure related to comprehension. His hierarchy of learning, from discrimination to concepts, from rules to high-order rules. Such an ordering, lends itself to the initial learning of a code, and may enlighten the instructor as to the concepts required before approaching particular tasks. Although all learning does not proceed in such an organized fashion, one cannot deny that

> In learning to read acquisition of word sound and the mastery of verbal concepts are basic, and if learning at higher levels is to occur with facility, attention must be paid to these fundamentals. (Williams, 1973, p. 127-128)

Another approach to reading stresses the perceptual organization of the process. Gibson (1969) emphasized the need for a structural framework that would induce conceptual invariants. Her first phase was concerned with developing some competence in hearing and speaking, utilizing the phonological, semantic and syntactic components of the language, supported by a conceptual base which included the interrelationships of ideas. Initially graphic features would be increasingly differentiated leading to discrimination between writing and drawing. At the second stage distinctive features of the sound-symbol systems would be established linking them to form words. In the third and final stage rules for unit formation would be stabilized based on correspondence between phonological and graphilogical systems, rules of orthography and sound, grammatical constraints and meaning. Gibson saw reading as "the establishment of effective strategies for the perceptual search leading to the detection of structure" (Williams, p. 131).

More recent models of the reading process support this perceptual search with the pursuit of meaning. Smith (1971) differentiated between the task of learning to read and fluent reading, between reading for word identification and reading for comprehension, a distinction also made by Weiner and Cromer (1967). Smith saw distinctive features as a tool for word identification which he called mediated word identification as contrasted with immediate word identification or instant word recognition (Figure 2.1). Likewise comprehension could be mediated or immediate, the latter being dependent on the reader's experience and knowledge of the way words and letters occur together in the language. "This prior knowledge, which reduces the alternative number of possibilites that a letter or word can be is termed redundancy" (p. 7). Such knowledge

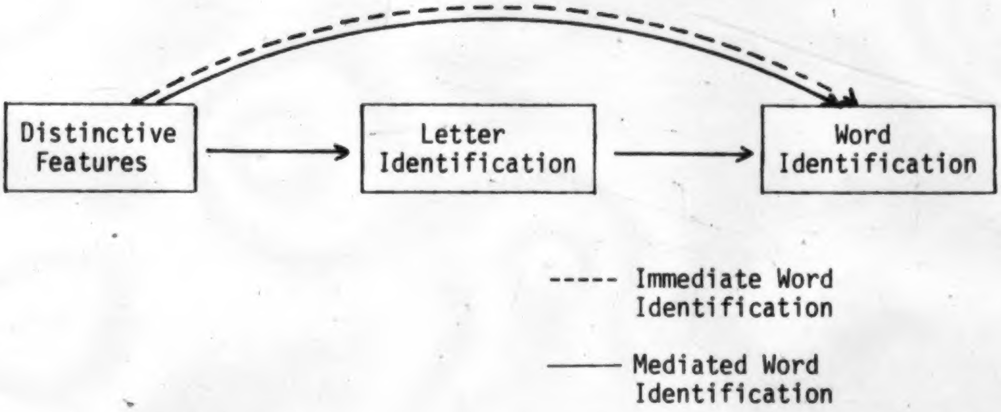

Distinctive Features
Letter Identification
Word Identification
----- Immediate Word Identification
—— Mediated Word Identification

FIGURE 2.1

IMMEDIATE AND MEDIATED WORD IDENTIFICATION
(Smith, 1971, p. 7)

facilitates comprehension which Smith represented as follows.

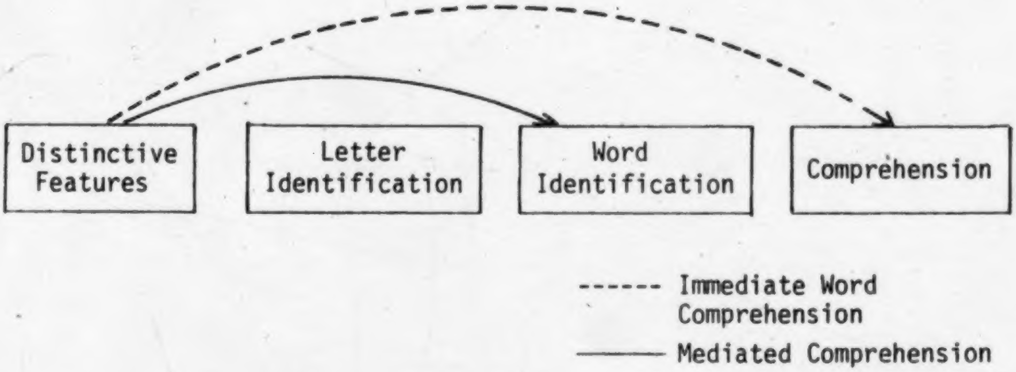

Distinctive Features
Letter Identification
Word Identification
Comprehension
------ Immediate Word Comprehension
——— Mediated Comprehension

FIGURE 2.2

IMMEDIATE AND MEDIATED COMPREHENSION (p. 8)

He felt that the orthography is relatively less important than a knowledge of language.

Interpreting reading as a communication process provides Smith with the opportunity to use technological terminology to pinpoint particular problems of the beginning reader. He conjectures that channel capacity, that is, the amount of information which can pass through a channel at one time, and noise, whatever degrades or confuses the message, make reading intrinsically more difficult for the novice. He observes that the more familiar a word becomes the less redundancy is required to identify it. A further difficulty for the beginning reader, noted by Smith, is tunnel vision which occurs when the individual focuses on words, preventing utilization of the grammatical rules which facilitate prediction. Summing up the position of the novice, Smith recognizes the same basic cognitive skill in the child and adult but states "What the child does not know is where to look for the distinctive features of letters: he knows how to look but not what to look for" (p. 224). "The child needs evidence, not instruction" (p. 227), supported by feedback.

Goodman (1970) views reading as a psycholinguistic process, an interaction between thought and language. The acquisition of meaning depends on an individual's ability to associate his experiences with concepts he has formed and with the language of his community. The learner must also select that to which he should pay attention and that which he should ignore through anticipation of the message. However Goodman notes, that in some circumstances "oral language may represent partial perceptions which are too fragmentary or distorted" (p. 14).

The same writer also stresses the reader's dependency on three basic sources of information, namely, grapho-phonic knowledge, syntactic structure, and semantic awareness. Grapho-phonic knowledge includes the usual spelling pattern which relates to the sound pattern, the sound-symbol association. This link acquires meaning through the grammatical sequences and interrelationships, the pattern markers such as function words, inflections, and punctuation, as well as the transformational rules which carry deep structure and meaning. The third cue system, semantic awareness includes his prior experiences together with the concepts he has formed and the vocabulary he has acquired.

Goodman, in contrasting early and proficient reading, notes a marked decrease in steps, the proficient reader jumping from graphic input to meaning while the early reader utilizes oral and aural input before grasping the content. He concludes that

> Reading is an active process in which the reader selects the fewest cues possible from those available to him and makes the best possible choice. (p. 19)

Furthermore he stresses that a reader must have a payoff to continue reading for "Competence is best achieved when the learner's focus is on the content and not on the reading itself" (p. 21).

The third linguistic approach is found in Ruddell (1974) who views the reading process as a skill within the total language arts area. He recognizes three levels of increasing depth from surface structure, to structure plus semantics to deep structure, with decoding the central task. For Ruddell comprehension involves relational meaning, lexical meaning, and is dependent on the mobilization of interest, attitude, and values available to organize data. "He [also] speculates that there may be a relationship between the optimal unit for instruction and particular characteristics" (Williams, p. 146) of certain learners.

From the preceding discussion it can be seen that the reading process is a complex procedure which fuses a variety of skills. In Figure 2.3 it can be seen that the individual begins by developing concepts through the interplay of perception, experience and language. The labels he attaches increase in number extending and expanding word knowledge. This vocabulary growth evolves through awareness, defining criterial attributes, classification and categorization with the words assuming specific roles within the language. When an individual approaches the reading task he must in addition discriminate sounds auditorily and then visually identify the symbol of the sound. As in oral expression, these must be blended together through the

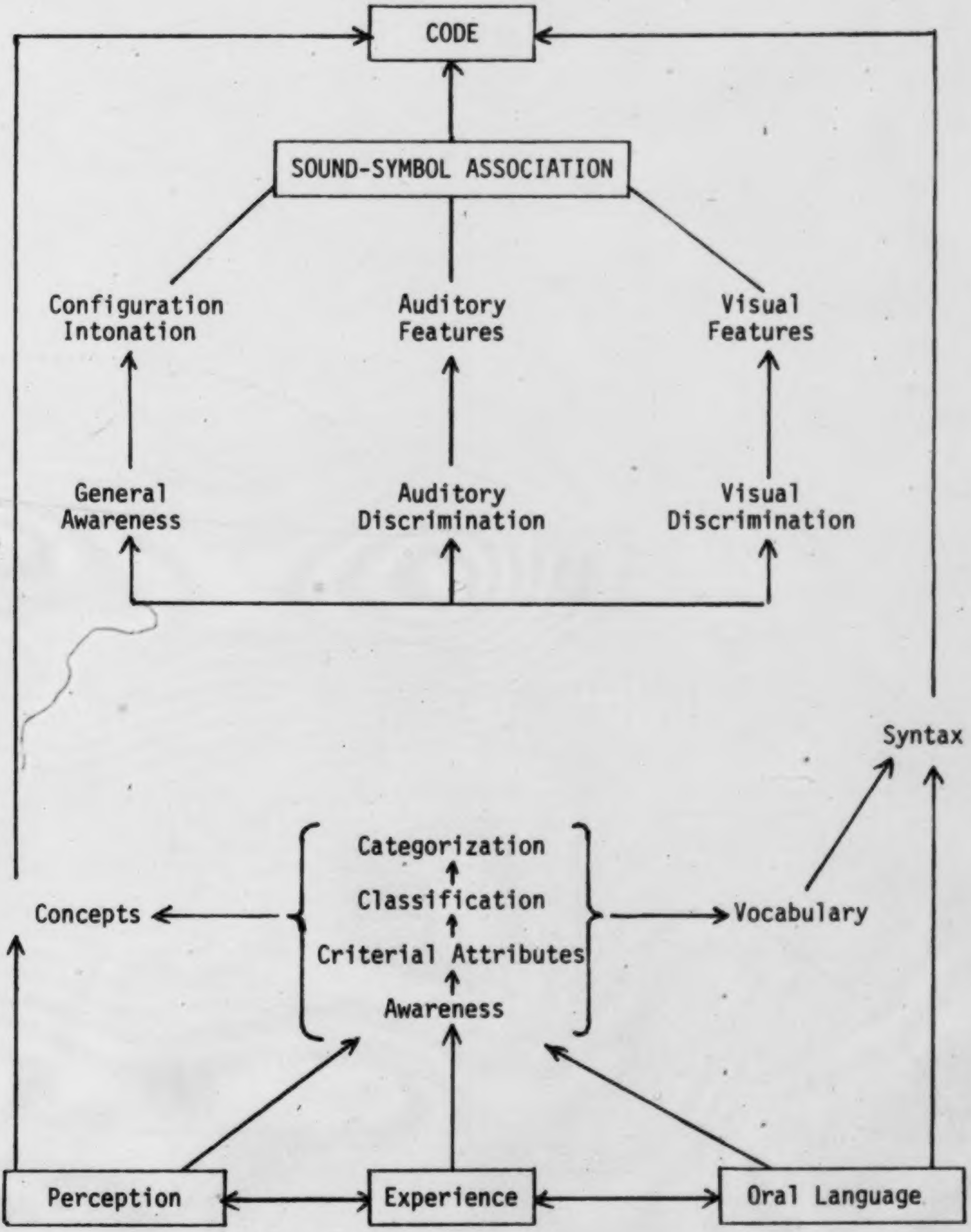

CODE
SOUND-SYMBOL ASSOCIATION
Configuration Intonation
Auditory Features
Visual Features
General Awareness
Auditory Discrimination
Visual Discrimination
Syntax
Categorization
Classification
Criterial Attributes
Awareness
Concepts
Vocabulary
Perception
Experience
Oral Language

FIGURE 2.3

THE READING PROCESS
(After Gagné, 1970, and Siemens, 1973)

sound-symbol association to form units or words which symbolize the concepts discussed above. These ideas are linked together in context to present a coherent message. However coherence is achieved only when the reader is an active participant linking sound to symbol, concept to word, word to word and sentence to sentence.

The complexity of the reading task and the numerous channels utilized provides many potential points for breakdown. (See Figure 2.3.) Although current study seems to indicate it is only one aspect of the total communication process, it is a key tool to continued learning.

THE EFFICACY IN THE USE OF LANGUAGE IN THE READING TASK

Reading demands that the individual "be able to understand the meaning that is presented to him through symbols" (Jenkinson, 1973, p. 39). In order to accomplish this task the reader must possess not only a knowledge of the code but a knowledge of the way language is structured and acquires meaning. Interest in the role of syntax and semantics in reading has provoked research for some time, recent research having better tools to investigate the connections.

Hopkins (1970) in her study on Linguistic Competency and Reading with thirty-five Grade 1 children from various socio-economic backgrounds found that the phonological system was under control but that they had not mastered morphological and syntactic systems. Positive correlation was found between morphology and word recognition, paragraph reading and total reading scores. Boys were found to be better on syntax. Hopkins noted a positive correlation between linguistic competency and beginning reading.

Weber (1970) exploring the use of grammatical content by Grade 1's felt that they were aware of the restriction of grammar but had a tendency to overuse preceding context. She found, too, that low readers made more ungrammatical errors so she concluded that

> when readers neglected the constraints of the preceding grammatical content they were attending to the task of identifying and perhaps decoding the features of the graphic display . . . grammatical errors were disregarded more than twice as often as they were corrected, the ungrammatical errors were corrected nearly twice as often as they were ignored. (p. 157)

She felt that poor readers lacked strategies to acquire meaning.

Working with structured and unstructured word lists Weinstein and Rabinovitch (1971) found that good readers learned structured lists in fewer trials than unstructured lists indicating that syntactic cues facilitated recall for good readers. "The difference between the two groups is their ability to make use of the information inherent in the grammatical structure of a sentence. Poorer readers have not generalized grammatical markers" (p. 30).

Fagan (1971) in his study attempted to determine if the reading comprehension of Grade 4, 5 and 6 pupils was affected by number and type of transformations in the language of the passage. The sample of the study was 440 boys and girls ages 9 to 12 from an Eastern Canadian school. His findings appeared to indicate that deletion and embedding transformations tended to make sentences and passages more difficult than passage comprehension. He stated in an article about his study,

> Reading appears to depend upon the type of syntactic structure of the printed language . . . it would seem that children would find it easier to read if they readily understood and analyzed the various structures, and understand the various lexical items in such structures. (Fagan, 1972, p. 172)

Another researcher interested in the effect of language structure on the reading task was Cosens (1974). In a study on Deletion Produced Structure and Reading she examined the effect of deletion produced structures on word identification and comprehension of 1st and 2nd grade students. Primary materials were analyzed and stories selected from the Ginn Basic Readers to be presented intact, i.e. with no deletions, and with deletion. For the students deletion produced structure proved to be more difficult than sentences with words inserted. Both syntactic and semantic cues appeared to be used by the learners at this level. It was concluded from this study that application of deletion transformation was a more significant factor in comprehension than word identification.

Further, the material examined showed a high incidence of sentences produced by deletion transformations especially in preprimers and third grade readers. The most common deletion transformation up to Grade 2 was the imperative. "It was concluded that the introduction and reinforcement of syntactic patterns was not systematically controlled in the materials analyzed in this study." Earlier Strickland (1962) and later Kaiser, Neils and Florians (1975) had noted the same discrepancy of syntactical development in school materials.

In an earlier investigation of the relationship between language and reading Strickland (1962) observed that children who comprehend well in silent reading and listening made greater use of the elements of subordination in their oral language than children who did not comprehend the code well. This discovery hinted at what later studies have demonstrated.

A comparison of high and low readers by Loban (1963) affirmed that there is a contrast in language competency between these two types of readers, the high readers being more skilled. He also noted increasing complexity accompanying increasing age, indicating a growing awareness of the structure of language.

Sentence formation was explored by Denner (1970) through the use of logographs. He found that problem readers had an "inability to integrate and subordinate word meaning to sentence meaning revealing a lack of syntactic competency" (p. 282). He felt that they seemed "to lack awareness that the sentence contained the meaning not the units," even as late as Grade 5 some subjects still failed to subordinate the perceptual motor meaning of the separate words to the larger linguistic reality of the sentence (p. 887).

Ruddell (1967) reporting on his own research noted that there was a "correlation of .68 and .44 between children's language development measured early in Grade 1 and the respective factors of vocabulary achievement comprehension measured at mid-year" (p. 492). He concluded that facility in oral expression, particularly vocabulary knowledge and an understanding of sentence structure is basic to the development of reading comprehension skill.

It would appear then that "reading comprehension is a function of the similarity of patterns of language structure in the reading material to oral patterns of language structure used by children" (Ruddell, 1965, p. 408). The child must learn to utilize these constraints in order to anticipate and predict what message is being presented.

If an individual is to bring meaning to the printed symbols knowledge of the syntax and semantics of the language represented is required. This knowledge must then be linked to the code in such a way that continual integration of symbol with concept and thought occurs. In order for such associations to be maintained a broad and deep oral language foundation appears essential.

THE DEVELOPMENT OF LANGUAGE

To be able to participate in the act of reading, it is necessary to have a basic knowledge of the language represented in the print. The development of this specific knowledge is dependent upon the conditions within the environment (Vygotsky, 1962; Wilkinson, 1971).

Early language development occurs through imitation, reduction and expansion (Smith, Goodman & Meredith, 1970; Wilkinson, 1971) with induction of the latent structure within the language becoming increasingly differentiated, supported by a growing lexis. Such maturation is dependent upon the occurrence of intense child-adult interaction (Wilkinson, 1971; Vygotsky, 1962) with social accommodation playing a significant role (Garvey & Bendebba, 1974), though it may be restricted by the individual's cognitive ability (Ausubel, 1963; Chukovsky, 1971).

Growth in syntactic awareness has been explored in research and found to have a general pattern of development. Mastery is demonstrated in the number of words produced, the length of sentences or thought units, the increasing subordination, the particular types of transformations, morphological rules, and the use of connectives.

Several researchers (Hopkins, 1970; Hunt, 1965; Loban, 1963; O'Donnell, Griffin & Morris, 1967; Strickland, 1962) have noted that the number of words spoken increases with age. O'Donnell et al. recorded the means and range for spoken language to Grade 7. Boys tended to be more voluble demonstrated by a wide range while girls were less loquacious and had a more restricted range in total number of words produced (see Table 2.1).

Sentence complexity also reflects developing language skill, though the sentence has proven difficult to identify and measure. An early definition (Strickland, 1962) described it as a distinct falling of intonation which signalled a terminal point. Later Loban (1963) used the communication unit which consisted of "a group of words which could not be divided further without loss of their essential meaning" (p. 7). More recently Hunt (1965) identified what he called the minimal terminable unit (T-unit) which was grammatically capable of being terminated with a capital letter and a period. It preserves "all subordination achieved by the student, and all of the coordination between words and phrases and sub-clauses" (p. 21). This unit was developed for analysis of writing but also has proven useful as a measurement of oral language. O'Donnell et al. (1967) confirmed that it was a sensitive measure of development towards maturity in

TABLE 2.1

MEANS AND INDIVIDUAL RANGES IN WORD-LENGTH OF TOTAL RESPONSES IN SPEECH OF BOYS AND GIRLS AT SIX GRADE LEVELS AND IN WRITING AT THREE GRADE LEVELS
(O'Donnell, Morris and Griffin, 1967, p. 43)

	Kindergarten		Grade 1		Grade 2	
	Mean	Range	Mean	Range	Mean	Range
Speech						
Boys	230.5	103-437	248.8	63-508	370.9	163-842
Girls	188.3	82-442	241.5	46-445	334.3	206-669
Both	209.4	82-442	245.1	46-508	352.6	163-842
Writing						
Boys						
Girls						
Both						

	Grade 3		Grade 5		Grade 7	
	Mean	Range	Mean	Range	Mean	Range
Speech						
Boys	556.9	210-1028	643.6	390-1016	870.2	330-2101
Girls	469.6	258-636	670.1	254-1160	655.1	380-1007
Both	510.3	210-1028	656.0	254-1160	748.0	330-2101
Writing						
Boys	210.9	93-408	366.1	240-572	561.2	262-1489
Girls	238.6	115-372	411.9	237-861	504.4	351-797
Both	225.6	93-408	387.5	237-861	536.6	262-1489

children's language development, oral and written.

When using this measurement researchers O'Donnell et al. have found the T-unit length increases from grade to grade "with statistically significant increases in T-unit length from Kindergarten to end of Grade 1 and end of Grade 5 to end of Grade 7" (p. 45). Boys tended to produce slightly longer T-units than girls though the mean length of T-units was quite similar, except at Kindergarten level. This reaffirmed the conclusions of Loban (1963) that as age increased, utterances were longer, more complete and more complex.

Though increasing complexity is revealed by the use of movables (Strickland, 1962) and subordination (Hunt, 1965; Loban, 1963; O'Donnell et al., 1967), more recent research is concerned not only with movables and subordination but with the importance of transformations as delineated in transformational grammar (Stageberg, 1965).

Through the use of transformational rules an individual can generate an indefinite number of thought units from Kernel sentences. O'Donnell et al. describe three main categories of transformations.

1. the provision for proper combination of elements
   e.g. PAST & VB — VB & Past
2. those that change the type of sentence, Q, NEG, IMP, PASS
3. those that represent joining one string or embedding which may include deletion, substitution or expansion (summarized by Braun, 1974, p. 466).

O'Donnell et al. concluded that the "relative density of these transformations within T-Units signalizes the degree of maturity attained" (p. 50). Numerous notable grade level differences were found but the greatest overall increases from one grade to the next proved to be the particular transformations which are produced by the application of deletion rules in transformational grammar. The researchers concluded that "two independent clauses as wholes is easier for children than deletion of the subject of one and coordination of predicates" (p. 93).

A significant area, the obligatory and morphological rules, has also proven an aid to determining language maturity. Noun plurals, progressives, and passive are relatively well understood by school entry, while tense is less well comprehended, followed by derivatives and comparatives. Menyuk (1963) found that nursery children could choose the correct structure but they did not follow the additional obligatory rules. Regular past forms were often substituted for irregular past by the nursery child.

Furthermore, language maturity is demonstrated by the use of connectives for they reveal a growing ability to link one idea with another. "And" is the most overused conjunction, and Hunt (1965) viewed it as "an index of immaturity significant for grade at the .01 level" (p. 22). Menyuk (1963) found that the conjunctions _if_ and _so_ were used by Grade 1 but did not show complete acquisition by the first grade group. _But_ and _although_ cause difficulty until Grade 2 (Katz & Brent, 1967) whereas _because_, _for_, _or_ and _then_ are fairly well understood by the second year in school (Katz & Brent, 1967; O'Donnell et al., 1967).

Though the basic language structure is acquired by the time the child is in his fourth year (Ruddell, 1967; Wilkinson, 1971), its usefulness is restricted by a limited vocabulary. It is only as the range of words increases and multiple meanings develop that modification of meaning by the sentence or paragraph can be understood. With macrodevelopment of vocabulary in children the learning of language appears to be easier.

Since syntax is learned within a limited vocabulary, the individual must learn to adapt new words to the structure. Initially such extension will come through the visual field and be based upon concrete, factual information (Vygotsky, 1962). This syncretic growth will move from vague associations to collections, from chain complexes to diffuse complexes to pseudo-concepts. Such development moves the individual from autistic thought to directed thought (Piaget, 1973).

Autistic thought is intuitive leaping from the premise to the conclusion under personal schema of analogy with visual schema sometimes taking the place of proof of deduction. It adopts successively opinions which, if they were compared, would contradict each other. The language used lacks precision in reference, qualifying words, conjunctions and order. There is little concern with the "how" of things, because introducing consequence rather than cause.

In contrast, directed thought pursues an aim and is adapted to reality, being capable of admitting truth or falsity. It is a communicable intelligence backed by proof and schema. Vygotsky (1962) recognized the need for system in thought stating that "a concept can become subject to consciousness and deliberate control only when it is part of a system" (p. 92).

Such a system of thought has been found to be first apparent at the age of 7-8 years (Piaget, 1973; Vygotsky, 1962). Both researchers stressed that "the child's intellectual growth was contingent upon his mastering the social means of thought, language" (Vygotsky, p. 51), though "development must complete certain cycles before instruction can begin" (p. 94).

Within the environment of language syntax supplies the basis for the generation of sentences and the cues to the role of words in spoken and written language while semantics furnishes the range of alternative words, provides for multiple meanings and thoughts, with the integration of the two aspects depending upon the development of thought in the individual.

In reading this knowledge is adapted to a printed formal code, which calls upon the individual to bring meaning to orthography through a blending of many skills. The code is formal and abstract, acquiring meaning only when the oral language it represents is well understood (Ruddell, 1967; Wilkinson, 1971).

VOCABULARY AND ITS GROWTH

As was noted above growth of vocabulary is essential to the development of language. Key concepts are represented by the words and through the language milieu the lexicon of the individual becomes a repertoire of words which denote the standardized attributes and notions of his community being constantly modified by his experience, in order to communicate with others who comprehend the same language.

Such a vocabulary must represent a sufficient number of common characteristics associated with each symbol, the word, permitting effective exchange of information.

The word is an invariable symbolic representation of a concept. It acquires meaning through "the active encounter of thinking individuals with reality where the organism mediates sensory data in order to ascribe meaning to it" (Evanechko, 1970, p. 16). Through awareness, discrimination, and repeated experience the individual extends and expands his lexicon (Dechant, 1970) each new experience demanding modification of currently held meanings or concepts.

The concept is an abstraction, a cognitive construct, which becomes increasingly complex as experience is gained. It has critical attributes and is idiosyncratic (Carroll, 1964; Dechant, 1970; Evanechko, 1974). The concept is the individual's image or representation, contrasting with the word, the symbol, and each should evoke the other (Carroll, 1964).

A concept may represent something very concrete, such as objects or places, or refer to something that is not immediately and directly available to sense, for example, charity (Brownell & Hendrikson, 1950). One person's abstraction will not be exactly like another person's notion. At the same time an individual's concept is subject to alteration along various dimensions, moving from concrete to abstract, from vagueness to clarity, from exactness to generalization. While a concept evolves, the core of denotative properties expands, and connotative attributes appear, such as implication, inference and figurativeness. Such variability stresses the peculiar nature of each individual's repertoire of concepts, for they are dependent upon his specific stage of development and range of experience, related through his particular integrating process.

The process that links the concept and the word appears to be thought (Vygotsky, 1962; Watts, 1967). Thought establishes the relationships which lead to identification, categorization and generalization. Word meaning becomes process and product as the individual interacts with the environment (Evanechko, 1970).

The quality of the interaction with the environment is dependent upon the nature and amount of information the individual can process. Since mental growth proceeds from the concrete to the abstract, vocabulary development reflects the changing pattern of the maturing child, both in quantity and quality of word knowledge. Research has been able to delineate its path of development.

In a summary of early research in vocabulary growth, Grant (1965) noted particular characteristics pinpointed by each one.

1. Children have vague and half-assimilated impressions of many common objects.
2. Concrete orientation is still evident even at age 10.
3. A common source of error is a response based on similarity of sound (the clang association observed by Feiffel and Lorge, 1950, p. 9).
4. In the early years the accurate knowledge of word meaning is based on the immediate and the familiar.
5. The young child tends to be specific when defining a word (e.g. a bed is to sleep in) as compared to older students

who use a range of class inclusions and synonyms.

6. Definitions of older children indicate a movement towards defining words in terms of action contents, toward definition in terms of relatively content-free general thing names (p. 23).

Interest in the growth of vocabulary was shown by M. K. Smith (1941) in her study of word knowledge from the ages of six to nineteen years. Since the concern was for understood vocabulary directions were adapted to the age of the student. One hundred items were previously designated in the English Vocabulary Test. Smith concluded that there is growth in the "average size of vocabulary from grade to grade although the rate of increase varies and is not very regular" (p. 330). Older children know more words and utilize them more fully.

Russell (1954) investigated quantity and quality of vocabulary. He wished to determine the dimensions of a child's vocabulary, that is, its breadth and depth, as well as to understand the developmental patterns in the acquisition of terminology in specific subjects, such as social studies, science and mathematics. Words were arbitrarily chosen from a list constructed from Thurstone's Teacher's World Book, which provided the range of frequency of the words. The results revealed the expected growth from grade to grade with a tendency for growth to be greatest in the upper elementary grades. Breadth of meaning rapidly increased at this level. Boys tended to be more variable than girls, except in Grade 7 and 12. Girls tended to have a wider range of meanings in social studies with boys having the greater range in sports, hobbies and recreation. On the whole the superiority of girls in vocabulary development was challenged.

Concern for quality in vocabulary is demonstrated in a study by Feiffel and Lorge (1950). They administered the Stanford Binet Form L Vocabulary test to 900 children, male and female, ages 6 to 14 years. The subjects were considered slightly above average in mental ability, were white, American born individuals living in the city. Definitions given were classified in five categories, synonym, use and description, explanation, demonstration and repetition, and error response. The average frequency of use of these classifications is shown in Figure 2.4. The researchers found that six and seven year olds favored use and description, 8 year olds in addition used demonstration, illustration and repetition. Older children preferred definitions by synonyms and explanation, though occasionally were dependent on categories used by younger children. Error response decreased with increasing age. Primary children tended to use isolated and/or concrete aspects whereas older individuals abstracted commonalities and classified words.

Kruglov (1953) constructed a multiple choice test based on the system devised by Feiffel and Lorge. She found her results revealed a similar pattern of vocabulary development.

Grant's (1965) research revealed a qualitative difference in the responses of good and poor readers. Good readers tended to use more synonyms (p. 90) while poor readers tended to be more concrete and less abstract in their responses. A greater number of the responses of poor readers employed perceptual properties and particularized contents. The range of vocabulary was greater for good readers.

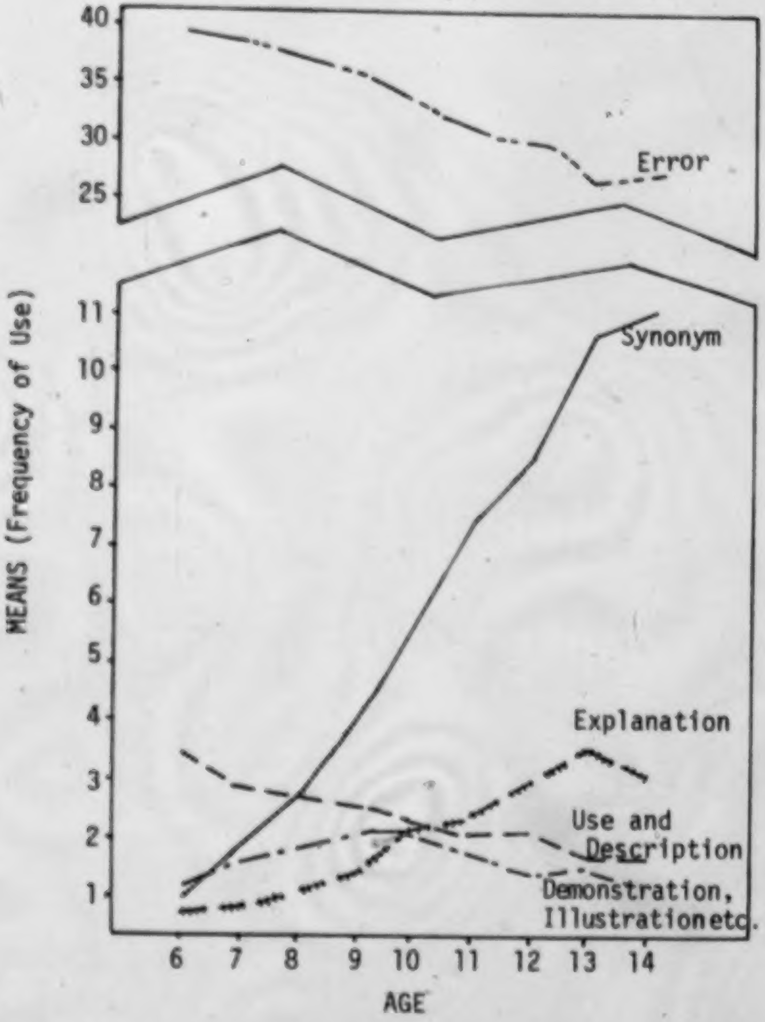


FIGURE 2.4

MEAN FREQUENCY OF USE OF FIVE QUALITATIVE CATEGORIES BY AGE
(Feiffel and Lorge, 1950, p. 9)

Using the instrument adapted by Feiffel and Lorge, Jackson (1968) explored the nature of two types of vocabulary, a core vocabulary and a specific vocabulary as explained by a group of high readers and a group of low readers. Although both responded similarly to the core vocabulary, with a majority of functional-conceptual choices, their responses were different in the specific vocabulary. The low readers had a majority of descriptive explanations while the high group employed conceptual responses. Such a contrast pinpoints the importance of the quality of word knowledge to the reading task.

A recent study in qualitative differences in vocabulary attempted to interpret them in terms of semantic competence (Evanechko, 1970). A Semantics Features Test was constructed consisting of two hundred and seventy-six paired comparison items and the student was asked to select the better definition. The words were controlled for difficulty and included nouns, verbs, adjectives and adverbs. Five logical groupings were established, namely: similarity, relation as in contrast, action, explanation, and class membership. It was administered to Grade 5 and 8 students in three contrasted settings in Alberta. The results revealed "a substantial change in the organization of meaning categories with change in age" (p. 12). The younger students were dependent upon concrete relationships or examples to ascertain meaning. Their choices were less abstract and strategies less economical. Older students went beyond sensory data and experiential data to look at relationships among the stimuli. Evanechko concluded:

> If children's meaning space is not well developed their processing of stimuli will result in inferior concepts being formed in terms of breadth and depth . . . with the development of more efficient and economical dimensions of meaning, concepts will increase in

> meaning and the individual's view of his reality broaden as is generally the case with learning and maturation. (p. 249)

All of these studies point to increasing extension and expansion of vocabulary with increasing age. Growth occurs in quantity and quality, the latter being particularly related to concept formation ability. The greater an individual's range of concepts, the more he is able to identify, classify, categorize and generalize. As abstraction increases dependence on the immediately observable diminishes so that responses are evoked by the verbal stimuli, the words, rather than an iconic image.

The quality of vocabulary is contingent upon how the individual identifies and classifies experience. In the process of distinguishing one object or event from another, the individual focuses on certain characteristics. The nature of these properties reveal how he perceives experience and reflects his cognitive development.

THE RECOGNITION OF CRITERIAL PROPERTIES

The ability to perceive and discriminate the criterial properties is indispensable to the identification of an object or event (Vernon, 1962). Through "a wide range of relevant, concrete experiences which contain clear and unambiguous examples of the concept" (Downing, 1970, p. 118) the child identifies and labels the physical world. By contrasting the positive instances with some negative illustrations, criterial properties are highlighted (Payne, 1972), facilitating the beginning of classification.

Through the analysis of the results of two experiments conducted with children between six and fourteen, Bruner (1966) observed that there were two approaches to the defining of attributes or criterial properties. The first method grouped objects initially under perceptual features (color, size, and pattern), then arbitrary functional features (what can I do with it?) and finally appropriate functional features (you can eat it). In this approach six year olds relied heavily on perceptual features but with increasing age functional properties were more apparent.

The alternate approach involved characterization in terms of syntactical structure. Using Vygotsky's classification, these were termed heaps, put together because that's how children decided they should go; complexes, in accordance with a rule that does not uniformly account for inclusion; and finally, superordinate concepts, one universal rule accounting for all inclusions. While the complexive grouping declined with increasing age, the superordinate grouping was maximized with increasing age. For Bruner this development of superordinate grouping provided "power for organizing acts of information processing into more integrated and long range problem solving efforts" (p. 11).

Siemens (1973) in her study on description, placed the identification of criterial properties as an essential task in the early development of description (p. 48). Her sixteen subjects were average or high language users (rated by the classroom teacher) and of two age levels 8.6-9.5 years and 11.6 to 12.5 years. She analyzed the responses of categories of meaning table (see Appendix B) and determined the amount of use for each one. She found that a simple concrete stimulus (a button) elicited a greater variety of response than the other stimuli (a cap, a picture of a dog and an auditory cue, p. 86). The number of categories of meaning identified from the youngest average users to the oldest high language-users increased, suggesting that an increased number of categories can be anticipated with increasing age and greater language power demonstrated (p. 88).

With the picture of the dog, some of her subjects demonstrated what Vernon (1962) had observed earlier, that younger children may often fail to notice, or ignore, what appears to be central in the picture while observing relatively unimportant detail.

The more abstract stimulus (auditory cue—horse) yielded a greater number of categories of meaning, possibly due to freedom to utilize various experiences, while the most used categories of meaning were color, size, use, part-whole relations and class names (p. 89).

In his study, Word Meaning Expressed Orally by Elementary School Children, Nixon (1976) explored the selection of criterial properties over a grade range from one to six. Four boys and four girls were chosen at each grade level, first, second, fourth, and sixth. The students were drawn from elementary schools in a community of about 25,000 near Edmonton. They represented the middle socio-economic class and were of average language ability, as designated by their classroom teachers. The tasks included were a verbal stimulus, real/vicarious experience, visual representation and extension questions (e.g. Tell me everything you can about . . .).

Nixon found a general increase across the four age groups in the number of criterial properties observed and labelled. However he also noted the effect of experience which sometimes caused younger children to give more criterial properties than older students on a given stimulus. Like Siemens, he found the verbal stimulus generated more response. The number of categories of meaning also tended to increase with increasing age. Labels for criterial properties and class names of stimuli, increased with age.

A developmental trend was demonstrated by Nixon's study for he found that six year old subjects named criterial properties for all stimuli with concrete referents but did not necessarily employ all the categories of meaning. Their responses tended to be concrete with a single word carrying a broad meaning and they were unable to give multiple meanings. The seven year old students increased the number of categories of meaning and sometimes supplied the class name for a concrete referent. In addition multiple word meanings appeared. Nine year old students used qualifying phrases when attempting to express the meaning of a word and used the greatest number of labels.

In a summary of criterial properties observed and labelled (p. 222) Nixon noted that 6½ year olds used the categories of color, shape, action of, use part-whole, where located and some class names. In addition eight year olds used texture, smell, qualities and function. The only categories not used by 11-11½ year olds were weight, smell, cause and connotation.

From this discussion it would appear that when a child includes a greater number of categories of meaning for criterial properties he is broadening his semantic space, improving the quality of his vocabulary and increasing his language power. Furthermore, as he moves from perceptual properties to the functional, to the abstract attributes he progresses along the developmental continuum of cognition. Additional evidence of his movement along the continuum of cognitive growth appears when he applies superordinate grouping rather than complexive grouping.

THE ACQUISITION OF CONSERVATION

One of the first indications of cognitive growth is the ability to conserve, to hold a concept invariant though perceptually it may appear to be variant. Such development marks a new stage in cognition—the "process of knowing in the broadest sense" (Rawson, 1969, p. 11).

Each individual forms a construct of experience by active involvement with the world around him (Evanechko, 1970). Individuals continuously interrelate with their environment modifying their construct. Such modification is facilitated by experience and the development of alternate ways of processing information.

"Knowing" depends upon an increasing awareness that leads to identification and later to multiple differentiation. Vernon (1952) elaborated four stages of knowing, specifically identified as vague awareness, generic object or general categorizing of an object, specific object, and identification. Experience which facilitates differentiation of objects, events and activities is essential if the point of knowing is to 'happen.' However this is also dependent upon how well the individual can benefit from experience, and how rapidly he can move through awareness to generic object, specific object to identification.

The ability to move from one stage of awareness to another appears to depend upon a factor observed by Vernon (1952). There is a décalage or time lag between each stage of knowing. Such a décalage was observed by Rawson (1969) between the learning of a rule of logic and its application to a new situation. The former researcher speculated that this time lag varied with each individual. If this is so, it would seem likely that it would also vary between types of learners, and could be a significant factor in the development of understanding by the learning disabled.

Aided by this process of knowing the individual moves through stages of cognitive growth. In his review of Piaget, Flavell (1963) discusses three major stages of cognitive growth observed by the noted investigator. Of particular interest for this study is the intermediate stage, concrete operations, which consists of two subperiods, preoperational and concrete operations.

In the preoperational subperiod (age 2-6 years) the child is egocentric, that is, he is unable to adapt his speech to the needs of the listener or circumstances. At this stage centration limits the child to focusing on one salient element of an event from which he draws irreversible conclusions, often based on pronounced perceptual features. He then proceeds to link successive states and configuration syncretically, feeling no need to justify his thinking. Such transductive thinking prevents him from constructing a chain of reasonings. He tends to develop a replica of the concrete world, represented by images rather than symbols (Flavell, 1963). Such imaging mitigates against the organization of experience for though facilitating the reproduction of the immediately observable, interferes with transfer to new situation.

Indications of a subtle change begin to appear in the second half of this subperiod of prerepresentational thought (4-5 years). The child becomes "more testable, able to focus his attention on a specific task and to apply adapted intelligence to it rather than simply assimilate it into some egocentric play" (Flavell, 1963, p. 162). He becomes aware of more than one aspect of an object and realizes that certain actions are reversible. His skills are fragmentary, being partial compensations which Piaget calls regulations (Flavell, 1963). These changes in cognitive construction represent a mid-point in the transition to concrete operations.

During the period of concrete operations (ages 7-11) the child establishes a more stable organization by linking the known world to thought through the construction of invariants which are representations of the physical world, and the more remote concepts such as number, time, space, quantity, weight, and volume. The acquisition of these invariant concepts is known as conservation.

Conservation is "the understanding that no change has occurred regarding one or more aspects of an object or relationship despite change in other perceivable features" (Wallach, 1963, p. 246). Such affirmation appears to depend on several factors including identification of the elements, a range of experience with the materials, ability to sequence and freedom from the iconic image.

Recognition of the elements develops from sufficient opportunity to distinguish and to utilize them, such a skill being acquired through the steps outlined by Vernon (1952) discussed previously.

The importance of experience with the materials was observed by Lovell and Ogilvie (1960). They realized the need for the child to play with clay—warming it, squeezing it, changing its shape, or letting it harden, leading to familiarity with the material and its behaviour. The researchers viewed such experience as essential to developing the hierarchy of skills within each task of conservation. This ordering appears to parallel Gagné's (1970) steps in "knowing" which lead to the moment of discovery. It also suggests a sequence of skills and assumes ability to order, an ability not particularly well-developed in learning disabled children (see earlier discussion).

Research has demonstrated that the ability to conserve emerges in a predictable pattern. This pattern is evident in the more abstract invariants examined, such as substance, weight and volume. Substance is the first acquired, generally achieved by 7-8 years, with conservation following within a year or two. Conservation of volume is sometimes delayed until adolesence (see Table 2.2). Although Smedslund noted earlier acquisition of these abilities, the order remained constant.

Awareness of conservation evolves through three stages of knowing—denial, occasional admission and ready agreement (Klees & Lebrun, 1972; Lovell & Ogilvie, 1960; Smedslund, 1961). Within the second stage growth errors tend to occur. Such an error is the "first stage of trying to achieve correspondence or concordance between

TABLE 2.2

AGE LEVELS AT WHICH CONSERVATION OF SUBSTANCE, WEIGHT AND VOLUME ARE ACQUIRED

Area of Conservation	Elkind (1961)	Lovell and Ogilvie (1960)	Piaget and Inhelder (Smedslund, 1961)	Piaget (Flavell, 1963)	Smedslund (1961)	Wallach (1963)
Substance	7-8 years	8-9 years	7-8 years	8-10 years	5-7 years*	7-8 years
Weight	9-10 years	9-10 years	9-10 years	9-10 years	5-7 years*	8-9 years
Volume	11+			12+		Adolescence

*economically superior milieu.

systems of representations" (Bruner, 1966, p. 322). This error seems to be a transition in the process of learning and essential to growth. Therefore the activities of the child should encourage increasing awareness utilizing error or miscue in experience, for the mutual influence of error and experience are more important than just practice (Ausubel, 1963).

Both the development of conservation and the awareness of these invariant concepts may be hindered by the perceptual field of reference. Soenstrom (1966) discovered this inability to move beyond the perceptual cue in her subjects. She linked the lack of movement away from the perceptual to dependency on the iconic image which interferes with transfer and application, and is characteristic of the intermediate stage of cognitive development. However extinction of the perceptual cues did not guarantee conservation (Smedslund, 1961; Soenstrom, 1966) though labelling and verbalizing appeared to aid movement away from perceptual attributes (Bruner, 1966; Soenstrom, 1966).

The power of perceptual properties was also noted by researchers Klees and Lebrun (1972) who in their study of dyslexic children cite evidence that an "abusive preponderance of perception hinders the arrival of . . . thought processes at the more evolved and more operative intellectual stages of development" (p. 14).

In order to free the individual from immediate perception, both a variety of experience with materials (Elkind,1961; Lovell & Ogilvie, 1960) and labelling (Bruner, 1966; Soenstrom, 1966) seem to be necessary. It is through the representation of experience in symbolic form that the individual is freed to manipulate ideas and reconstruct experience. As language is acquired it supports and strengthens cognitive development, though its own growth appears to be restricted by the level of cognitive skill possessed by the individual.

In the previous discussion cognitive growth has been segmented into stages and levels, into prerequisites and process. However we must not forget that cognitive growth is continuous and fluid in nature. Ausubel (1963) recognizes the levels but stresses that cognitive growth is along a continuum from the concrete to the abstract with fluctuations occurring between stages and age being less important to its growth than experience.

By the acquisition of cognitive organization through experience and representation of that experience in verbal and symbolic form the individual is enabled constantly to expand and deepen his knowledge of reality. When any aspect of this process or its intermediate stages is weak or cognitive growth is inhibited, a nebulous construction of reality results.

SUMMARY

The purpose of this study was an examination of the learning patterns of the disabled reader. Achievement records reveal that his reading performance lags one to two years behind his anticipated level. In addition research has revealed that he may have imprecise and fragmented perception, be weak in both expressive and receptive language, have limited concepts, experience difficulty sequencing events or ideas and have difficulty integrating information.

The reading task with which he has difficulty involves the simultaneous processing of information perceived through experience and represented by language. This background provides the source for auditory and visual cues, syntactic and semantic clues while at the same time builds vocabulary and concepts. When approaching the reading task the individual needs to use these several channels of information, each with its own capacity and tolerance for "noise." The extent to which the message is comprehended reflects the degree to which integration of the channels has occurred or it may indicate lack of language skill.

Oral language has shown positive correlation with reading achievement. It supplies the structure and lexicon which are represented in the formal code. Children who subordinate one thought to another and who elaborate upon their thoughts are able to use linguistic constraints when reading. However less able students appear unable to sense that meaning lies in the sentence rather than the unit. Meaning can be given to the code only when adequate language background and vocabulary facilitate it.

Language development depends upon sufficient child-adult interaction and the child's ability to benefit from experience. Mastery of language is demonstrated in expressive language through word production, sentence length and its complexity revealed by the use of connectives, subordination and embedding. Since syntactic structure is acquired by the age of four years, the macrodevelopment of vocabulary is needed to enable the individual to benefit from his knowledge of syntax.

Vocabulary develops both in quantity and quality. It has been demonstrated that growth in both aspects occurs with increasing age and experience that broadens semantic space. The latter is greatly dependent upon the kinds of concepts formed through identification, classification, categorization and generalization, which in turn are determined by the nature of the criterial properties recognized.

The kind of criterial properties noted reflect the progress of the individual along the developmental continuum of cognitive growth. As he moves from perceptual to functional attributes to conceptual attributes his ability to represent objects and ideas in thought increases as well as his ability to direct thought.

Ability to think first becomes evident when the individual is able to conserve, that is, to hold a concept invariant. Research has shown that the initial step, conservation of substance, occurs at 7-8 years, with conservation of weight following in about a year, while volume may not be conserved until adolesence.

All learning depends upon the establishment of familiarity. The amount of experience required to establish this knowledge varies with each individual. A phenomenon evident in learning is the décolage which appears to vary in length with each individual and the material he is studying. Learning is also aided by the growth error which usually marks the beginning of awareness of an idea but also indicates incomplete mastery.

Progress in reading is contingent upon multiple facets of knowing, but primarily appears to be dependent upon the individual's basic cognitive ability which enables him to benefit from experience.

CHAPTER III

THE DESIGN OF THE STUDY

In the chapter the design of the study is discussed under the following headings: the sample, the research instruments, the pilot study, the data collection, the data analysis, and the reliability of the instruments and analysis.

THE SAMPLE

Twelve subjects were chosen for the sample based on the following criteria:

1. attendance at school for three or four years
2. average or better academic potential, as measured by the WISC-Revised
3. a reading performance one to two years below the anticipated level, based on the scores of the Stanford Achievement Test, Primary II.
4. an absence of apparent physiological or mental handicaps to account for the plateau in reading achievement.
5. a unilingual background, namely English
6. a lack of extreme emotional problems.

All but two of the sample were receiving remediation in a special classroom.

Research into the particular use of the Weschler Intelligence Scale for Children to determine potential reading disability supports its reliability for this purpose but also questions such confidence. Generally a 15 point discrepancy between the verbal and performance scores has been thought to relate to reading disability. The population with a reading handicap does not always demonstrate such a marked discrepancy (considered statistically significant) between the verbal and performance sections of the test (Ackerman, Peters, & Dykman, 1971; Hartledge, 1970; Huelsman, 1970). However the verbal score does tend to be lower (Ackerman et al., 1971; Neville, 1961; Roebeck, 1960). Although a good understanding of vocabulary does not guarantee success in reading (Roebeck, 1962) adequate verbal facility would seem to be required before encoding and decoding takes place. Consequently verbal performance on an intelligence test could provide an initial clue to a basic deficiency.

The subtests scores of the WISC have also been explored in relation to their ability to indicate a reading problem (Ackerman et al., 1971; Huelsman, 1970; Leton, 1972; Kender, 1972; Neville, 1961; Roebeck, 1960; Rugel, 1954; Sawyer, 1965). Generally it has been concluded that better diagnosis may be made through the examination of the subtest scores. Particularly significant are low scores in information, digit span, arithmetic and coding. Some researchers conclude that whatever results are obtained from an individual intelligence test they must be interpreted as "assets" or "deficits" (Kendor, 1972; Leton, 1972) and be tempered by absolute functioning (Ackerman et al., 1971).

The absolute functioning of the children in the sample was determined by the examination of the reading scores obtained on the Stanford Achievement Test, Primary II. The Stanford Achievement Test: Reading is administered annually to all children within the system of the Edmonton Public School Board as a means of surveying the progress of the individuals. According to Harris (Buros, p. 1103) this is one of the best series now available for making such yearly assessment of reading achievement in the elementary school. He also notes that the format and print are excellent, while its standardization compares favourably with other test standardizations, though its validity must be checked for its relationship to local curriculum. In spite of this, Harris found it to be a useful instrument for appraising individual reading progress. Since this study is concerned with individual learning patterns, the results obtained in the schools were considered to be adequate measure of independent reading skill.

The remaining criteria—attendance, absence of physiological or mental handicaps, unilingual background, and lack of extreme emotional problems—were acquired through the records of the individual available in the schools, and obtained through consultation with administrative personnel and teachers within the schools.

Final determination of the sample relied principally upon the reading scores of the Stanford Achievement Test, Primary II and the potential for academic success as indicated by the WISC-Revised verbal, performance and full scale scores, all being within the average range of ability.

THE RESEARCH INSTRUMENTS

Five areas of functioning related to language, cognition, and reading were examined. Included were tasks of conservation, tasks which elicited criterial properties, a storytelling task, tests of vocabulary, and oral reading.

Cognition—Tasks of Conservation

The tasks of conservation were those designed by Rawson (1969) in her research, Reading and Cognition.

The Concrete Test of Conservation includes the conservation of substance, weight, and volume at three levels of increasing complexity, according to the number and type of deformation that occurs. The subject must determine whether the objects of comparison have more, less or the same amount, weight or volume. He is then required to explain his decision. These tasks were originally designed for subjects of the same age and grade level as the present study.

In the original administration of the Stories Test of Conservation the subject was required to read two stories which illustrated concepts of conservation. Upon completion of each story the examiner verified the comprehension of the story through questioning, prior to asking the questions related to conservation. The nine questions of the Stories Test of Conservation correlated with the questions and levels of thinking of the Concrete Test of Conservation.

One modification of the Stories Test of Conservation was necessary since the subjects of the present study were unable to read at the estimated level of the stories. The stories were taped permitting the subjects to listen to the story rather than to read them for himself. In this way a comparison was provided between the understanding of the concrete situation and verbal expression of conservation, a more remote experience, demanding not only understanding but representation.

Tasks of Criterial Properties

The tasks of criterial properties were taken from the research of Siemens, Description: A Measurement of Language Power. These tasks require the subjects to describe an object, a picture and an auditory cue; specifically a hat, a dog, and a horse. The object in this study was a sun hat with three attached pins, in contrast with the unadorned hat used by Siemens. The additions to the hat were made in anticipation of further description; though certainly meeting this anticipation it also served to stress other factors, as did the use of a picture postcard of a dog with a toy bone.

By the addition of the pins to the hat and with the selection of a picture postcard having a bright red background with a toy bone for the dog, the tendency of the subjects to focus on parts of the whole rather than on the total item before him/her was emphasized. In the case of the picture the need to specify the focus was revealed by some of the responses which often described the background or minor object before describing the central figure.

Through these tasks the subjects are presented with increasingly more complex stimuli, moving from concrete to abstract, and from those based on experience to abstract concepts. The simplest form of thinking is thinking in terms of objects directly observable while the more remote the object or event the more necessary it is to hold the images in mind (Siemens, 1970).

Tests of Vocabulary

Standardized tests of vocabulary were used to determine both the quantity and quality of vocabulary. The tests chosen provided a comparison of the understood vocabulary and the ability to explain the meaning of a word.

The Peabody Picture Vocabulary Test is designed to estimate the verbal intelligence through measuring the hearing vocabulary of the individual (PPVT Manual). No reading is required as the subject may answer by pointing to the picture with his finger or by giving the number under the picture. The test covers a wide age range and is completely objective. The test was carefully constructed to provide an estimate of the comprehension of vocabulary.

A second vocabulary test was administered, the Stanford Binet Vocabulary Subtest. In this task the subject was invited to explain the meaning of increasingly difficult words until he had made a total of six consecutive errors, either incorrect or through inability to explain.

It was deemed essential to examine both aspects of vocabulary development for while the quantity of vocabulary represents production, the quality reflects the depth of vocabulary which facilitates flexibility and adaptiveness. By measuring the quantity and quality of vocabulary both performance and competency could be assessed.

Storytelling

This area of the study was also based on the research of Siemens. Directions were similar but the pictures were selected by the writer of this study. The three pictures chosen provided for the description of an extremely familiar experience (making a sandwich) to an illustration of a story (the whipping of Tom Sawyer) to a fantasy-inducing picture (an old stone house in an electrical storm). With colored pictures and a range of topics it was assumed that functional language production would be facilitated.

Telling a story is a very common mode of expression which has proven a valuable tool for researchers (O'Donnell et al., 1967; Penner, 1976; Siemens, 1973). It reveals the focus of the storyteller, the quantity and quality of his vocabulary and the maturity of his language. It may also indicate the individual's position along the concrete to abstract continuum, his subjectivity or objectivity and his ability to order information.

Oral Reading

The final area assessed was oral reading. A standardized oral reading test was given, the Gilmore Oral Reading Test. It is an individually administered test designed to provide a means of analyzing the oral reading of pupils from Grade 1 through 8. It consists of two forms, one for girls (C) and one for boys (D). In each form the paragraphs increase in difficulty as the subject progresses through the levels. It is an easily administered test, requiring the examiner to stop testing when the subject has made ten or more errors. The examiner makes note of specific types of errors or miscues. For the purposes of this study the miscues were of particular interest.

The value of such a test has been demonstrated in its wide use in school systems and clinics as a method of determining the student's level of reading ability in both word attack (accuracy) and comprehension as well as a diagnostic tool.

THE PILOT STUDY

A pilot study was conducted prior to the gathering of data. The purposes for this study were to

1. determine the suitability of the selected tasks for ascertaining the patterns of learning
2. record the time requirements of the various tasks
3. allow trial administration for the administrator.

Two subjects were chosen for the study. The first was a student of the same age, grade and intelligence as the sample, while the second subject was one year younger and one grade lower than the sample, though of the same intelligence and exhibiting difficulties similar to the subjects of the sample.

All the tests were administered individually to the subjects by the researcher in settings similar to the main study.

In the area of cognition, Rawson's (1969) Concrete Tests of Classification and Stories Test of Classification were administered as well as the Concrete Test of Conservation and Stories Test of Conservation. The results revealed that the amount of information contained in the Stories Test of Conservation constituted an overload of content for even the "normal" student at this age level.

Rawson in her study, Reading and Cognition, found her subjects in the Stories Test of Classification scored considerably lower than on the corresponding items in the Concrete Test of Classification. She concluded that "recognizing class inclusion relations in reading involves considerable restructuring of information" (p. 11).

In the present study the subjects would have been required to remember the content as well as reconstruct the information since the stories were orally presented on tape. Consequently it was decided to omit the test of classification.

In all the other areas—criterial properties, storytelling, vocabulary and oral reading—the original selections were retained. The contrasting results between the two subjects seemed to indicate a variance in learning patterns within each skill area.

DATA COLLECTION

Each area of data was administered as outlined by the original researcher or according to the directions of the manual, in the case of a standardized test.

Two exceptions to the original procedures used in the collection of data were in the Stories Test of Conservation and in the object and picture used for criterial properties. The modifications were delineated in the section above.

All the tasks were administered to each subject individually by the researcher in a classroom or office apart from the areas of school activities. Each subject was seen for a period of approximately one half hour for four days within one school week.

At the commencement of the initial session each subject was advised as to the purpose of the study and the procedures that would be used. Each subject was given an opportunity to hear his own voice on the tape prior to the commencement of testing.

The pattern of testing was as follows:

Day 1. Peabody Picture Vocabulary Test
Stories Test of Conservation
Day 2. Gilmore Oral Reading Test
Stanford Binet Vocabulary Subtest
Day 3. Storytelling
Criterial Properties
Day 4. Concrete Test of Conservation.

The tasks were ordered so that a specific or objective task contrasted with a general task on the same day. Each demanded the attention and concentration of the subject to the same task for a 5-15 minute period. Though on the last day of testing only one task was given, the three levels of conservation were tested at three different stations, permitting movement from station to station with the average length of stay at each station being about ten minutes.

The directions and administration procedures for each area of data collected are included in Appendix A.

All sessions were taped in order to verify the answers of the subjects. Criterial properties, storytelling and vocabulary were transcribed and reviewed by the researcher.

DATA ANALYSIS

Each set of data was analyzed under particular procedures related to the type of task involved. The method of analysis was preselected by the researcher. The succeeding discussion indicates the analysis used for each area of data.

Cognition—Tasks of Conservation

In the two areas of conservation the method of scoring was the same. A decision was rated 0 for a non-conserving decision and 1 if it was a conserving decision. The explanation offered by the subject was scored as follows:

0 for a non-logical, non-perceptual explanation

1 for a non-logical, perceptual answer

2 for a logical conserving answer.

The non-conserving explanation included inability to explain demonstrated either by refusal to explain or by a rambling explanation in which the train of thought was lost:

> e.g. well . . . because for the chickadees when its cut into little slices then it would come higher cause there's more slices but still . . . if you put all the slices together make one and for the blue jays they if you had in three then it would sort of . . .? (Subject F)

or a non-logical conservation explanation which did not logically follow a non-conserving decision.

> e.g. when asked if there was more or less or the same amount of wax in 2 doughnuts than in the ball of wax the subject decided "more" and supported it with "cause he made the doughnut smaller."

A non-logical conserving explanation was based on perceptual attributes, though it could have been a moral explanation. However no example of this occurred in this study.

e.g. it looked equal. (Subject B)

well, it looks bigger and closer together. (Subject C)

The logical explanation included such replies as the following.

e.g. cause you gave them the same amount. (Subject A)

because before we started the balls were the same and they should be the same even though they're cut up. (Subject F)

even though you squished it into shapes its the same 'cause you didn't take any away. (Subject H)

In the latter illustration the subject could also have indicated addition of material as support for conservation and maintained the logical explanation.

This system of scoring was developed from research (Goldschmid, 1967; Rawson, 1969; Smedslund, 1961) and seemed to distinguish adequately the patterns of learning for this study.

Task of Criterial Properties

The tasks of criterial properties were analyzed by determining which categories of meaning as delineated by Siemens (1970) were employed by the subjects. (See Appendix B.) The categories used were noted as well as the percentage of criterial properties employed.

This particular task focuses on the abstraction of the physical attributes which identify an object, providing a key to the way an individual perceives the object. By observing what criterial properties he utilizes we are able to discover the categories he uses to evolve meaning. The number of categories identified "increases with increasing age and may be higher in number in cases of greater language facility" (Siemens, p. 88).

Using similar tasks to Siemens, Nixon (1976) was able to associate the use of particular categories of meaning with a given age level.

Tests of Vocabulary

Each of the vocabulary tests was analyzed for specific information. The Peabody Picture Vocabulary Test was used to assess the quantity of vocabulary compehended by the subject. Consequently it was scored as outlined in the manual to obtain an estimate of the mental age of the subject. In contrast, the Stanford Binet Vocabulary Subtest, which indicated the type of meaning attached to a given word was rated according to the Feiffel Lorge Quantitative Analysis. This scale classifies the given explanation in five categories: error; demonstration, repetition, illustration, inferior explanation; explanation; use and description; and synonym.

Through these measurements it was possible to explore both the quantity and quality of vocabulary. Though it is possible to casually observe the increasing quantity of vocabulary, certain researchers (Russell, 1965; Smith, 1965) have demonstrated that vocabulary increases with increasing age. Other researchers focused on the quality of vocabulary as reflecting the mental development of the individual (Feiffel & Lorge, 1950; Grant, 1965). Feiffel and

Lorge were able to demonstrate that certain ways of defining a word are associated with particular levels of mental maturity. Grant's study revealed that the better readers possess a better qualitative vocabulary than the less able readers.

Storytelling

The storytelling tasks were subjected to an analysis that determined the quantity of certain language features, including

1. the total number of words (contractions and compounds were counted as the number of words of which they were composed)
2. the number of T-units
3. the number of words per T-unit.

The T-unit is a form of language measurement developed and labelled by Hunt (1965). The T-unit or minimal terminable unit includes the main clause with all subordinate clauses attached to it or embedded within it. The clauses are grammatically related, being simple or complex sentences but not compound. "The unit preserves all the subordination achieved by the student and all his coordination between words, phrases and subordinate clauses" (p. 21). In his own study Hunt found the T-unit sensitive to linguistic maturity.

Though initially used to analyze written language in upper grade levels it has since been utilized to analyze oral language from Kindergarten to Grade 7 and written language from Grade 3 to Grade 7 (O'Donnell, Griffin & Norris, 1967). In addition to establishing means and ranges for total number of words produced at each level, the researchers determined a range of words per T-unit and a mean number of words per T-unit for each grade level. These results indicate an increasing volume of words as age increases as well as greater complexity of unit structure. This reaffirms the work of earlier researchers.

Oral Reading

The results of the oral reading were analyzed in terms of the types of miscues evident as outlined in the manual of the Gilmore Oral Reading Test as well as examined under selected sections of Goodman's Analysis of Miscues (1969), namely syntactic proximity and acceptability. The areas selected for analysis seemed to involve the integration of vocabulary and language skills which are examined separately in this study.

Such an oral reading test provides a means of ascertaining the types of difficulties an individual tends to meet during a reading task. At the same time it is possible to note how he attacks an unfamiliar word and to what he relates his responses—the word, the beginning of the sentence, the sentence or the passage (Goodman, 1969). The individual cannot pass over difficult words and his rate tends to be restricted by pronunciation (Dechant, 1970).

Although the objective of reading is essentially to obtain the message, inability to decipher the code limits the individual's reception. Therefore it seems appropriate to use oral reading as a diagnostic tool and is recognized as such (Dechant, p. 30; Goodman, 1969).

When each separate area had been analyzed, an overall schema of the patterns of learning was determined.

RELIABILITY OF INSTRUMENTS AND ANALYSIS

The reliability of the research instruments was assumed since they were drawn from previous research at the University of Alberta or were standardized tests.

They were administered in a similar manner to the initial research or according to the test manuals.

The reliability of analysis was established by the use of two judges, each holding a Master's degree in Reading from the University of Alberta and both having had previous teaching experience. The third judge was the researcher of this study. One half of the sample was randomly selected and each judge scored the transcripts for the following areas:

Stanford Binet Vocabulary Subtest
Storytelling
Criterial Properties.

The Arrington formula was then applied to determine the amount of agreement between the three judges. The particular form used was that employed by Shandling (1970): "the responses in each observer's scoring that agreed with the others (i.e. doubling of the agreements) was divided by this total plus the disagreements" (p. 54).

$$\frac{2 \text{ x agreements}}{2 \text{ x agreements} + \text{disagreements}}$$

The degree of agreement determined by the application of the Arrington formula is shown in Tables 3.1, 3.2, and 3.3. For the response in criterial properties the percentage of agreement was .94 to .96 (Table 3.1). Table 3.2 reveals that the percentage of agreement

TABLE 3.1

PERCENTAGE OF AGREEMENT BETWEEN JUDGES ON RESPONSES FOR CRITERIAL PROPERTIES

	Agree	Disagree	Total Responses	% Agreement
Judges 1 and 2	334	26	360	.96
Judges 1 and 3	323	37	360	.94
Judges 2 and 3	328	32	360	.95

TABLE 3.2

PERCENTAGE OF AGREEMENT BETWEEN JUDGES ON VOCABULARY RESPONSES

	Agree	Disagree	Total Responses	% Agreement
Judges 1 and 2	136	16	152	.94
Judges 1 and 3	108	44	152	.83
Judges 2 and 3	93	59	152	.76

TABLE 3.3

PERCENTAGE OF AGREEMENT BETWEEN JUDGES ON RESPONSES IN STORYTELLING

	No. of Words				No. of T-units				No. of Words per T-unit			
	Agree	Disagree	Total	%	Agree	Disagree	Total	%	Agree	Disagree	Total	%
Judges 1 and 2	6	0	6	100	6	0	6	100	6	0	6	100
Judges 1 and 3	6	0	6	100	6	0	6	100	6	0	6	100
Judges 2 and 3	6	0	6	100	6	0	6	100	6	0	6	100

for vocabulary responses ranged from .76 to .83 while in the calculation of word production, number of T-units and words per T-unit there was unanimity.

The tasks of conservation, both concrete and stories, as well as the analysis of miscues for syntactic proximity and acceptability, and semantic proximity and acceptability were scored by agreement of the three judges in committee.

The standardized test was scored by the researcher.

SUMMARY

In this chapter the design of the study has been discussed under the following headings: the population, the sample, the pilot study, the research instruments, data collection, data analysis, reliability of instruments and analysis.

CHAPTER IV

ANALYSIS AND FINDINGS OF THE STUDY

INTRODUCTION

The purpose of this study was to explore the learning patterns of a group of disabled readers. Since current test procedures within the school system do not appear to have pinpointed the nature of their problem, it was hoped that this type of examination would identify more clearly the etiology of their difficulty.

The particular areas selected for investigation were oral reading, storytelling, vocabulary, criterial properties and conservation. Through observation of the relationship of the miscues to the context, the organization of expressive language, the quantity and quality of vocabulary, the nature of the perceptive and cognitive skills it was anticipated that their patterns of performance would become evident.

Subjects were chosen on the basis of an average or better score on the Weschler Intelligence Test for Children—Revised and a delay in reading progress of 1 to 2 years as revealed by the results of the Stanford Achievement Test, Primary II given in the school system. All but two of the subjects were receiving remediation in the schools.

The analysis and findings of the study will be discussed in terms of the use of language cues in the oral reading task, language structure in storytelling, vocabulary development, the perception of criterial properties and the emergence of the ability to conserve.

THE USE OF LANGUAGE CUES IN THE ORAL READING TASK

When an individual reads it is necessary for him to utilize both syntactic and semantic cues. In order to determine the extent to which these systems were employed by the disabled readers, an oral reading task was administered.

The Gilmore Oral Reading Test provided paragraphs of increasing difficulty which necessitated use of the language cues and ultimately yielded miscues for scrutiny. Analysis of these miscues enabled the researcher to explore the extent to which language cue systems were employed and if either of them demonstrated particular weakness.

Scoring Procedure

The errors were marked according to the directions in the manual accompanying the test, including mispronunciations, words given by the examiner, disregard of punctuation, insertions, hesitations, repetitions and omissions. Accuracy and comprehension scores were then determined according to the manual.

In addition, each miscue was rated according to the scoring keys in Appendix B, slight modifications of the Goodman Analysis of Miscues. The areas scored were syntactic and semantic proximity, as well as syntactic and semantic acceptability. In the case of the latter the judges found it necessary to add a category "bizarre" which was rated 0. It included mispronunciations such as "perclasses" for "purchases," "rexcuted" for "requires" and "extare" for "extra."

The errors defined as "not acceptable, not bizarre" would be substitution such as "exhausted" for "exchanged" or "grocery" for "George's."

The findings will be discussed under the heading of general observations, observations of syntax, observation of semantics and summary.

General Observations

According to Table 4.1 the grade equivalent for accuracy ranged from Grade 3.0 to Grade 6.4 with the mean score being Grade 3.9 and the median Grade 3.85. Including Subject B the mean score for comprehension is Grade 4.1 but if the extreme score is excluded, a mean of Grade 3.7 is maintained with median being between Grade 3.8 and Grade 4.1.

When examining the range of scores in Table 4.1 a division can be noted in the group with five subjects showing much better comprehension than the rest of the sample. In each of these cases the subjects demonstrate better comprehension than accuracy scores, with up to two years difference between the two scores in some instances. The balance of the group are still functioning at the primary level in both accuracy and comprehension.

Observations on Syntax

By classifying the errors according to the miscue analysis, it becomes evident that for eight of the subjects the tendency is toward major errors in syntax (Table 4.2). For seven of this group a greater number of their errors seemed unrelated or had little in common with the context. The eighth subject, E, more frequently

TABLE 4.1

ACCURACY AND COMPREHENSION SCORES OBTAINED IN GILMORE ORAL READING TEST

Subject	C.A.	Year in School	Accuracy		Comprehension	
			Raw Score	Grade	Raw Score	Grade
A	10.11	4	24	3.2	13	1.4
B	10.4	5	39	5.2	33	9.0**
C	9.9	4	26	3.4	25	5.8**
D	9.10	4	25	3.3	17	2.1
E	10.2	5	26	3.4	24	4.1**
F	10.2	5	32	4.2	24	3.8
G*	9.11	5	21	3.0	23	4.2**
H*	9.6	5	31	4.3	29	6.7**
I*	10.3	5	44	6.4	23	4.2
J	10.4	5	40	5.4	20	2.8
K	9.4	4	29	3.8	19	2.6
L*	9.11	4	28	3.9	18	2.8

* Girls

** Comprehension score higher than accuracy score.

TABLE 4.2

CLASSIFICATION OF MISCUES AND SYNTACTIC PROXIMITY PER GOODMAN'S MISCUE ANALYSIS (MODIFIED)

	Subject											
Syntactic Proximity	A	B	C	D	E	F	G	H	I	J	K	L
Unrelated or little in common	6	5	3	7	1	5	3	7	6	2	12	7
Syntactic function retained, though structure different	1	1	0	0	4	0	0	0	0	1	0	1
Major change of syntax—word, phrase	2	4	6	0	7	2	3	4	3	1	0	0
MAJOR MISCUES	9	10	9	7	12	7	6	11	9	4	12	8
Change in person, number or tense	2	0	4	2	1	2	3	1	3	0	1	0
Change in function word	1	4	4	1	3	2	3	0	0	0	0	1
Unchanged	4	0	4	10	4	6	6	9	5	1	5	0
MINOR MISCUES	7	4	12	13	8	10	12	10	8	1	6	1
TOTAL MISCUES	16	14	21	20	20	17	18	21	17	5	18	9

included making an actual change of word or phrase in his miscues. It is interesting to note that four of these eight subjects are able to comprehend at a level above their accuracy level (Table 4.1) in spite of their errors. Of the four remaining subjects who tend to make minor syntactical errors, two of them were able to comprehend beyond their accuracy level. It is not clear from this sample exactly what role syntax is playing in the reading task. However most of the major changes in syntax did appear to be unrelated to the text.

Syntactic acceptability is also examined. Generally it tends to demonstrate either non-acceptability or relationship to the whole passage, though the miscues of two subjects (F, H) fell equally or almost equally into the three categories of major miscues. Three of the four subjects who depend upon the passage were also higher in their comprehension skill than accuracy in decoding whereas only two of six subjects whose miscues were not syntactically acceptable were high in comprehension.

Comparing syntactic proximity and acceptability, the major syntactic changes correspond with lack of acceptability while minor syntactic changes were usually used by those who employed the whole passage to determine their choice of word. The exception was Subject E who though using the whole passage as reference still made major syntactic errors. Subjects F and H were as likely as Subject E to use the beginning of sentence/or the passage as the source of their cue.

TABLE 4.3

ANALYSIS OF MISCUES IN TERMS OF SYNTACTIC ACCEPTABILITY PER GOODMAN'S MISCUE ANALYSIS (MODIFIED)

Syntactic Acceptability	Subject											
	A	B	C	D	E	F	G	H	I	J	K	L
Not acceptable	8	6	3	7	2	4	3	7	9	4	12	7
Acceptable with beginning of sentence	2	3	5	2	7	5	4	7	0	0	1	1
Acceptable with end of sentence	1	0	1	0	0	0	0	0	0	0	0	0
Acceptable with sentence	1	0	0	0	1	1	1	0	0	1	0	0
Acceptable with total passage	4	5	12	11	10	7	10	7	8	0	5	1
TOTAL MISCUES	16	14	21	20	20	17	18	21	17	5	18	9

TABLE 4.4

CORRELATION OF SYNTACTIC PROXIMITY AND SYNTACTIC ACCEPTABILITY

Subject	Syntactic Proximity		Syntactic Acceptability	
	Major Syntax Change	Minor Syntax	Not Acceptable	Acceptable with Passage
A	*		*	
B	*		*	
C		*		*
D		*		*
E	*			*[†]
F		*		*[†]
G		*		*
H	*			*[†]
I	*		*	
J	*		*	
K	*		*	
L	*		*	

[†] As likely to use beginning of sentence for context as passage.

Discussion

From the data above it appears that as a group the subjects are not using the syntactic cues when they read, confirming what other researchers (Weber, 1970; Weinstein and Rabinovitch, 1971) have found, that poor readers rarely make use of the grammatical constraints. They do not appear to interrelate the parts of the sentences or the sentences to the whole passage, supporting Denner's (1970) contention that poor readers are unable to integrate.

Observations on Semantics

The miscues were also analyzed for their semantic proximity and acceptability. Of the twelve subjects, four (C, D, E, G) tend to make errors which would be classified as minor changes while the remaining subjects made major changes in meaning (Table 4.5). When major semantic change takes place they tend to be unrelated or changed due to partial use of the text, usually prior text.

Though generally the semantic acceptability of the miscues revealed little use of the end of the sentence, the sentence as a unit or the passage, three subjects (C, E, G) did relate more successfully to the passage. However, on their remaining miscues, like the other subjects, they show a tendency to select a word suited to the beginning of the sentence or to focus on the word giving either an unacceptable substitution or a bizarre translation of the immediate symbol.

The correlation between semantic proximity and semantic acceptability is shown in Table 4.7. Generally if the response was unrelated in semantic proximity it tended to be bizarre in semantic

TABLE 4.5

CLASSIFICATION OF MISCUES FOR SEMANTIC PROXIMITY PER GOODMAN'S MISCUE ANALYSIS (MODIFIED)

	Subject											
Semantic Proximity	A	B	C	D	E	F	G	H	I	J	K	L
Unrelated or vaguely related	6	4	3	7	2	6	6	17	5	3	12	7
Appropriate but unrelated	2	1	3	3	3	3	2	1	5	0	1	0
Change in meaning thru prior/subsequent text	3	6	6	2	4	5	2	1	1	1	2	2
% TOTAL MISCUES	69	79	57	60	45	82	55	90	65	80	83	100%
Antonym	2	0	0	1	0	0	0	0	1	0	0	0
Slight change substitution, connotation	3	2	6	4	8	2	4	0	5	1	1	0
Synonym	0	0	0	2	1	0	0	2	0	0	2	0
No change	0	1	3	1	2	1	4	0	0	0	0	0
% TOTAL MISCUES	31	21	43	40	55	18	45	10	35	20	17	0%
TOTAL MISCUES	16	14	21	20	20	17	18	21	17	5	18	9

TABLE 4.6

ANALYSIS OF MISCUES IN TERMS OF SEMANTIC ACCEPTABILITY PER GOODMAN'S MISCUE ANALYSIS (MODIFIED)

Semantic Acceptability	Subject											
	A	B	C	D	E	F	G	H	I	J	K	L
Bizarre	6	4	3	6	2	5	5	7	7	3	11	7
Not acceptable not bizarre	3	3	3	1	2	5	1	1	5	1	3	2
Acceptable with beginning of sentence	4	5	4	7	5	5	4	11	2	1	2	0
% TOTAL MISCUES	81	86	48	70	45	88	55	90	82	100	89	100%
Acceptable with end of sentence	0	0	1	0	0	0	0	0	0	0	0	0
Acceptable with sentence	1	0	0	0	2	1	1	1	0	0	0	0
Acceptable with passage	2	2	10	6	9	1	7	1	3	0	2	0
% TOTAL MISCUES	19	14	52	30	55	12	45	10	18	0	11	0%
TOTAL MISCUES	16	14	21	20	20	17	18	21	17	5	18	9

TABLE 4.7

CORRELATION OF SEMANTIC PROXIMITY AND SEMANTIC ACCEPTABILITY

	Semantic Proximity		Semantic Acceptability	
Subject	Unrelated	Meaning Change	Bizarre	Beginning of Sentence
A	*		*	
B		*		*
C		*		*
D	*			*
E		*		*
F	*	*	*	*
G	*		*	
H	*			*
I	*		*	
J	*		*	
K	*		*	
L	*		*	

acceptability. Though relying on the beginning of the sentence, Subjects D and H still are unable to make the association sufficiently well for the response to correspond with the total text.

The trend in the deployment of semantics in the reading task reveals a weakness in relating the word to its content. When the selection did relate to the text it tended to be linked with the beginning of the sentence, typical of a novice reader (Weber, 1970). All but one (E) of the subjects showed a marked inability to relate words to the context.

Discussion

Within this group of readers there seems to be a focus upon decoding the features of the graphic display with little concern for the syntactic or semantic constraints. It has been shown that such structures aid the reading task (Fagan, 1971; Ruddell, 1964; Weber, 1970). In spite of limited use of these cues several subjects in this sample are able to comprehend at their grade level. When they do achieve understanding it appears to be likely they depend on the passage to determine meaning supporting Fagan's (1971) viewpoint that comprehension of the passage is a more simple task than sentence comprehension.

Summary

The examination of the miscues which occurred in this particular reading task seems to confirm that these readers are making little use of the context. However when they do it relates either to the beginning of the sentence or the passage in syntax, and to the beginning of the sentence in semantics. The latter cue system appeared to cause more difficulty than the syntactic system.

Both cue systems seemed to be poorly utilized. This may reflect a weak knowledge of language, the milieu which provides the referents for acquisition of both the decoding and comprehension skills. Such lack of knowledge may be due to inability to benefit from experience or lack of opportunity to acquire adequate language background.

LANGUAGE STRUCTURE IN STORYTELLING

Storytelling has been demonstrated to be an effective diagnostic tool (Hunt, 1965; Loban, 1963; O'Donnell et al., 1967; Siemens, 1973). Using materials and procedures outlined in Chapter III the subjects were given an opportunity to tell a story.

Scoring Procedure

The scoring of the storytelling task included a word count, calculation of T-units and words per T-unit. In the word count a contraction or a compound word were usually counted as two words. The T-unit was a unit preserving "all subordination achieved by the student and all of the coordination between words and phrases and subclasses" (Hunt, 1965, p. 21). By dividing the number of words by the number of T-units, the words per T-unit were determined. These results were then tabulated (Table 4.8).

Observations and Discussion

Word production of the twelve subjects had a range of 35 to

TABLE 4.8

PRODUCTION OF WORDS, T-UNITS, AND WORDS PER T-UNIT FOR STORYTELLING TASK

Subject	Number of Words	Number of T-units	Words per T-unit
A	35	13	2.0
B	224	29	7.5
C	174	23	7.6
D	35	5	7.0
E	132	15	8.8
F	90	10	9.0
G*	148	19	7.7
H*	207	20	10.3
I*	115	15	7.7
J	76	11	7.0
K	155	22	7.1
L*	182	19	9.5

* Girls

224 words, excluding extraneous matter (Table 4.8). When comparing their production with the results obtained by O'Donnell et al. (Table 4.9) it can be noted that their limited production falls within the range for Grade 1 but below the mean for Kindergarten girls, who have a lower word production than boys of the same age level. Only two subjects have a word production above this mean (Tables 4.8 and 4.9). Two subjects did not produce sufficient words to fall within even the Grade 1 range. A comparison of the range of word production (Figure 4.1) and the means attained (Figure 4.2) illustrate the deficiencies in word production by the disabled readers.

Although the subjects told their own story based on a picture rather than a short film as in the study with which it is compared, the total word count does seem to be low.

Within this limited word production the number of T-units produced was from 5 to 29 (Table 4.8, Figure 4.3). One subject (B) had six more T-units than the next highest scorer. Then there appeared to be a grouping of five subjects who produced 19-23 "thoughts" with another cluster employing 10-15 "ideas." One subject (D) was able to produce only five T-units. The mean number of T-units was 16.7 with the median falling between 15 and 19, there being a marked division in the group at this point.

It is of interest to note that four of the five subjects who had higher comprehension than accuracy scores in the oral reading also fell into the high range of number of T-units. The remaining subject was in the upper range of the middle cluster.

The number of words per T-unit tended to cluster within the

TABLE 4.9

COMPARISON OF WORD PRODUCTION OF TWELVE DISABLED READERS WITH WORD PRODUCTION OF KINDERGARTEN, GRADE 1 AND GRADE 2 OF O'DONNELL, GRIFFIN AND MORRIS STUDY (1967)

	Kindergarten		Grade 1		Grade 2		Disabled Readers	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Boys	230.5	103-437	248.8	63-508	370.9	163-842	90.1	35-224
Girls	188.3	82-442	241.5	46-445	334.3	206-669	163	115-207
Both	209.4	82-442	245.1	46-508	352.6	163-842	114.4	35-224

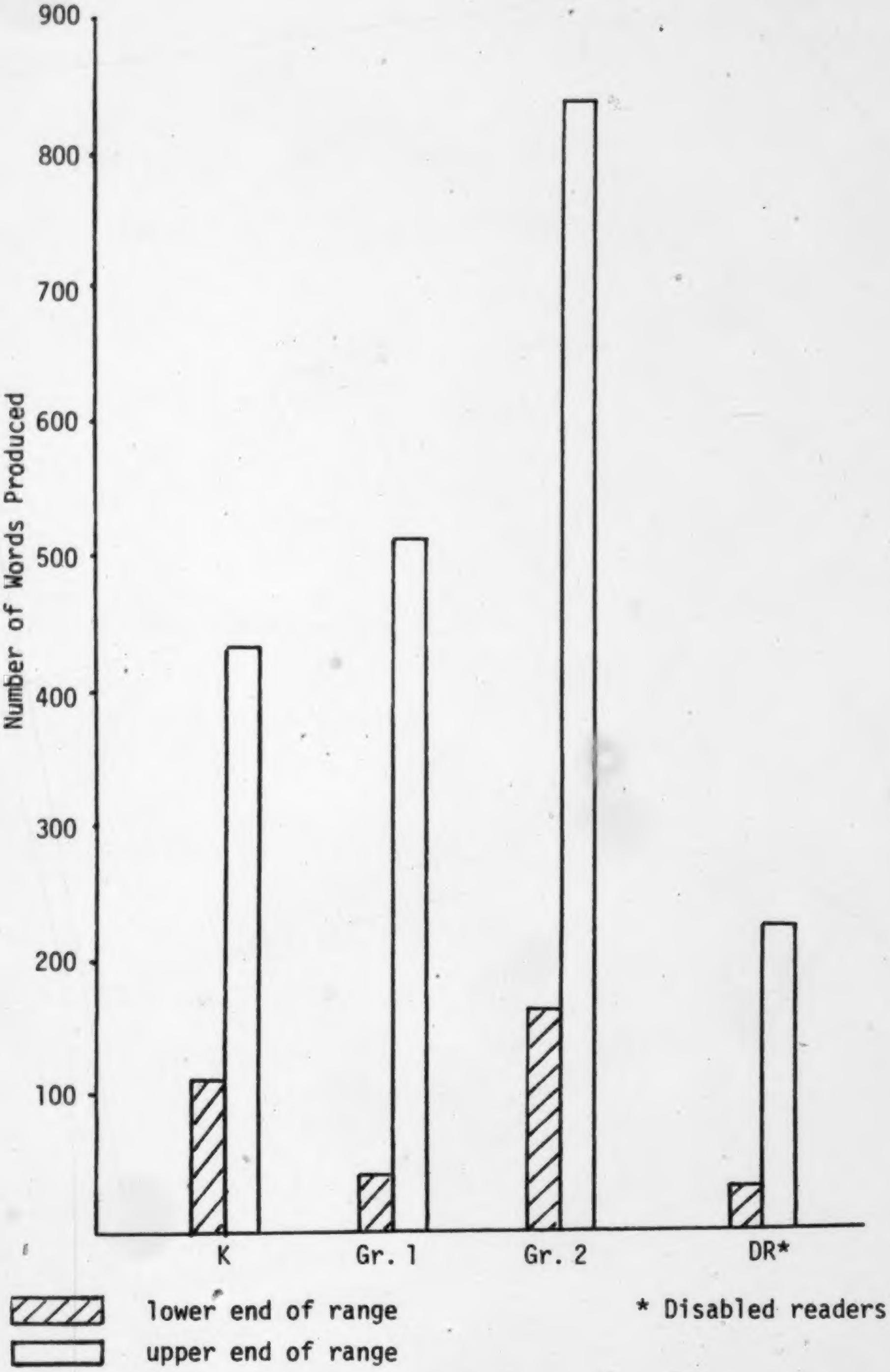


FIGURE 4.1

RANGE IN WORD PRODUCTION OF SUBJECTS IN O'DONNELL, GRIFFIN AND MORRIS STUDY COMPARED WITH DISABLED READERS

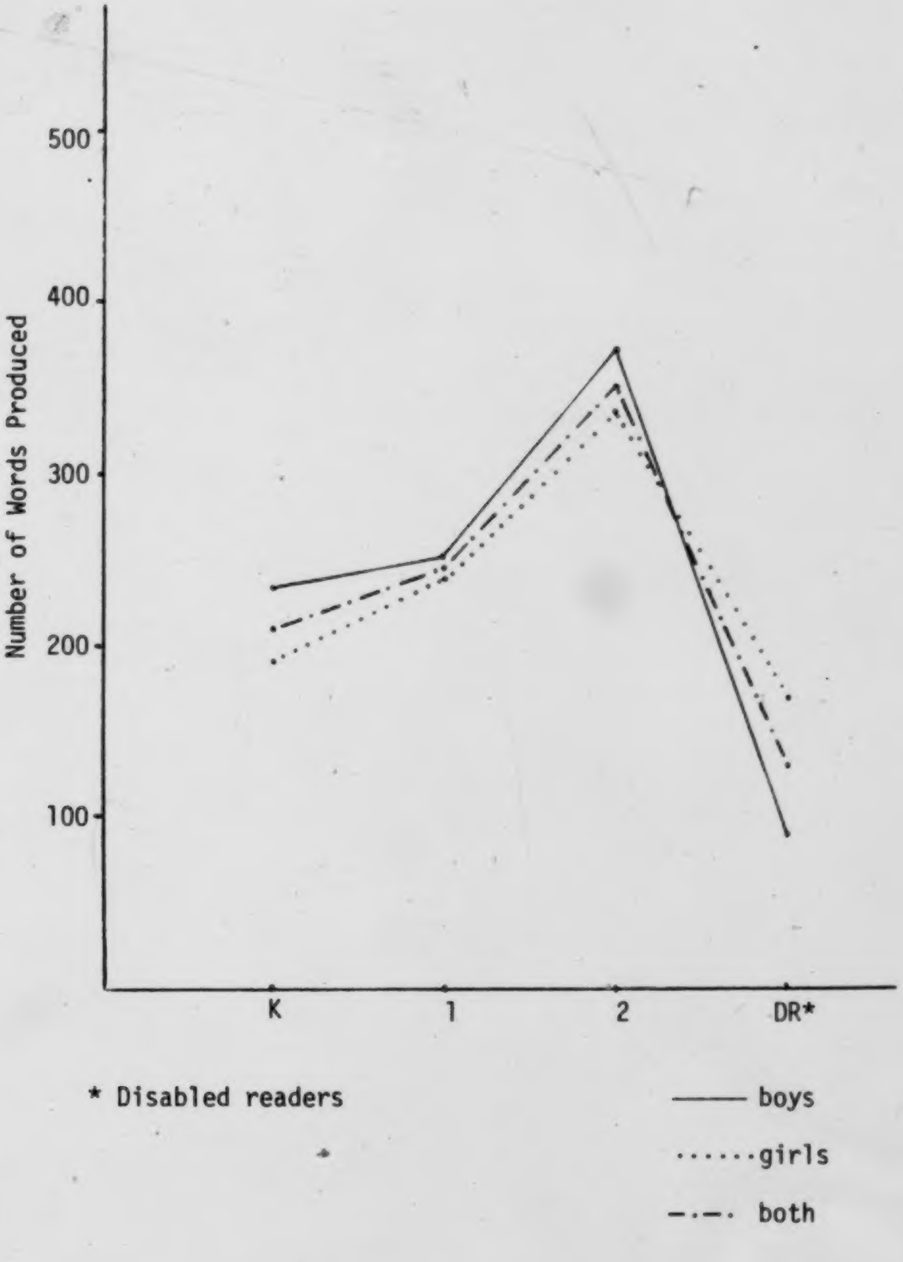


FIGURE 4.2

MEANS OF EACH GRADE LEVEL OF WORD PRODUCTION OF O'DONNELL, GRIFFIN AND MORRIS STUDY COMPARED WITH DISABLED READERS

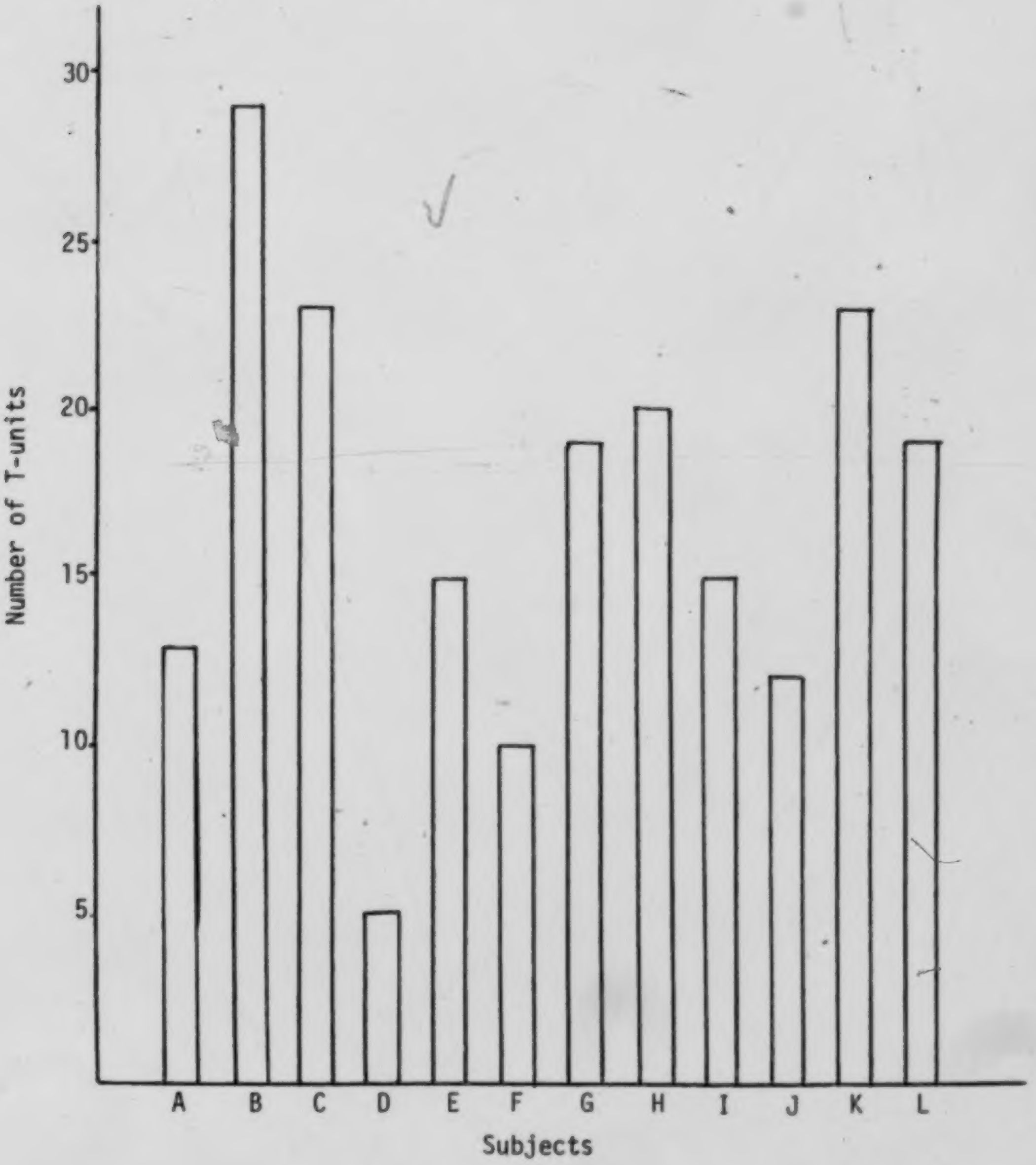


FIGURE 4.3

NUMBER OF T-UNITS PRODUCED BY TWELVE SUBJECTS

Grade 2 range (Figure 4.4). One subject (A) fell well below the range and means delineated in the research with which the sample is compared (Table 4.10). Four subjects (E, F, H, L) scored within the Grade 5 range and at or above the Grade 5 mean. For the remainder of the subjects the range of words per T-unit was 7.0 to 7.7 which is within the range for Grade 2 but below the Grade 1 mean. Both girls in this group score in the lower half of the Grade 3 range, though still below the Grade 1 mean.

The one subject (A) who was unable to produce a T-unit of any length, appeared to be using partial sentences similar to those of a two to three year old (Wilkinson, 1971). He tended to assume the listener knew to what or whom he was referring without actually using the label or pronoun.

Of the five subjects who comprehended at a level above their accuracy level, only two of them, are among the four who have maturity of T-unit at grade level. The rest produced T-units of 7.5 to 7.7 words.

In addition to the language maturity revealed through the calculations discussed above, other factors related to language development can be observed in this limited sampling of language.

Morphological rules (for example, past tense) seem to be understood, except for the use of 'hunged' by Subject B. A larger sampling with a variety of settings for language-oriented tasks would be needed to confirm this apparent growth.

The range of connectives employed by the subjects was restricted and lacked variety. Those connectives used are generally

TABLE 4.10

MEAN NUMBERS AND INDIVIDUAL RANGES IN MEAN NUMBERS OF WORDS PER T-UNIT IN SPEECH OF BOYS AND GIRLS AT SIX GRADE LEVELS COMPARED WITH DISABLED READERS

	Kindergarten		Grade 1		Grade 2		Grade 3		Grade 5		Grade 7		Disabled Readers	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
Speech														
Boys	7.47	6.2-9.5	7.97	5.2-9.5	8.52	6.3-9.8	8.79	7.4-10.8	8.85	7.7-11.5	10.21	8.6-11.6	7.0	2.0-9.0
Girls	6.66	4.0-9.2	7.96	5.5-10.1	8.15	6.6-9.7	8.67	7.7-10.0	8.95	7.6-11.2	9.39	8.1-12.7	8.8	7.7-10.3
Both	7.07	4.0-9.5	7.97	5.2-10.1	8.33	6.3-9.8	8.73	7.4-10.8	8.90	7.6-11.5	9.80	8.1-12.7	7.6	2.0-10.3

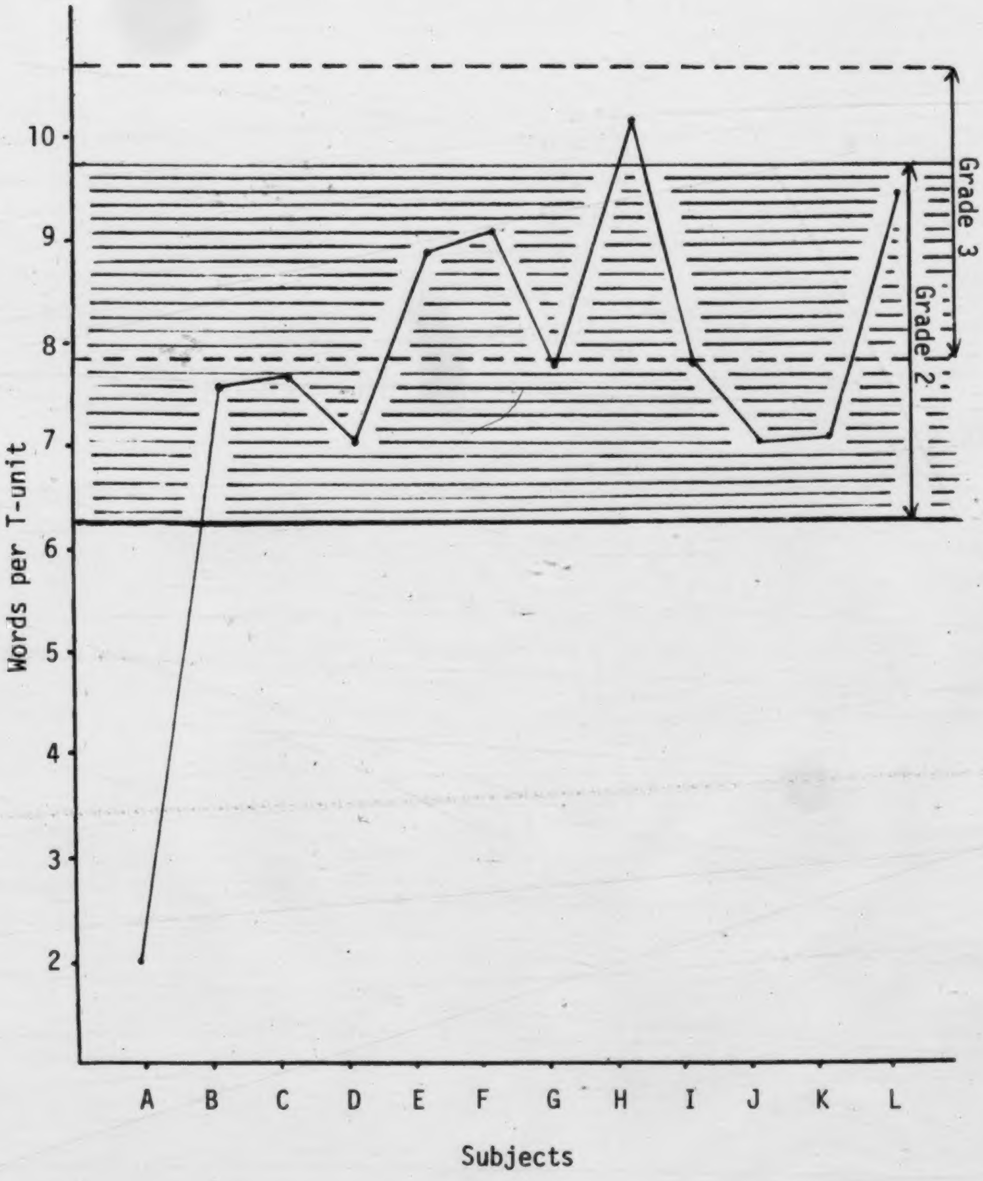


FIGURE 4.4

WORDS PER T-UNIT OF TWELVE SUBJECTS SUPERIMPOSED OVER THE RANGE IN T-UNIT PRODUCTION OF THE SUBJECTS IN O'DONNELL, GRIFFIN AND MORRIS STUDY (See on Table 4.10, p. 95) understood by the end of Grade 2 (Katz and Brent, 1967; Menyuk, 1963) for instance, so, and and 'cause. The most predominant connective in the stories, and, is considered to be an index of immaturity "significant at the .01 level for each grade level" (Hunt, 1965, p. 22). This particular sample substantiates this viewpoint as the following examples demonstrate.

> This is a boy and I think he was bad, and wasn't reading his books. Well, he's getting whipped cause he wasn't working and they have fair feet. Their teacher is whipping him with a stick. And he's real scared and the some of the kids are laughing. And they have a wooden floor and three benches in the back and a light. And instead of using a chalkboard in the back they use little chalk things that write on and they . . . it has . . . . they write what they have to write. (Subject F)

> This boy's only seven years old and he couldn't reach everything so he went and get a step . . . a chair and he wanted to get some bread. The bread's on the other side of the room so he had to carry the chair to the other side of the room to get some bread. So he got a loaf of bread, it was already sliced bread, so that was good, so he had to carry the bread, take the bread to the other side of the room and the chair to the other side of the room and he brought some jam . . . ah . . . two flavors of jam. So he's putting on some jam. (Subject B)

Two other indicators of language growth, subordination and embedding, were rarely evident in the stories of the sample. In the case of the former aspect, two subjects used that and another used 'cause with a fourth subject introducing a sentence with "as I was going upstairs." Occasional embedding occurred when adjectives were used to describe a noun, for example "haunted house" and "two brothers." The most extended sentence and the only one like it in the total responses was the following. "When he comes back in class in the afternoon, after going to have lunch, the teacher's really mad at him and gives him a lickin'" (Subject E). In contrast most of the stories read like this:

"Little Johnny came home. He was really hungry. He had his key so he opened the door. He came in. He couldn't figure out what he was going to eat. So finally he was looking through the cupboards. He got out two loaves of bread. He got a knife, a whole bunch of jam, a plate and a chair . . ."

The sentence structure in these stories seems similar to the "chain of reasonings" evident in the syncretic thought outlined by Vygotsky (1962).

Summary

The expressive language of the subjects within this sample is quite immature. Generally the range of word production for the subjects is within the lower limits of the Grade 1 range with the mean of the sample below the mean for kindergarten.

The total number of T-units produced ranged from 5 to 29. Clustering occurred at 10-15 "ideas" and with "19-23" ideas.

The number of words per T-unit demonstrated Grade 2 maturity, though below the Grade 1 mean. Four subjects who were in the Grade 5 range, were the exceptions.

Morphological rules were generally well known but the connectives used were those understood by Grades 1 and 2 with _and_ being used excessively. Subordination and embedding were rarely used, the stories being given in kernel sentences.

VOCABULARY AND ITS DEVELOPMENT

From the preceding tasks in this study it appears that the subjects lack facility in this aspect of language. As a result of the deficit it was decided to examine the development of vocabulary determining both its quantity and quality. The findings will be discussed under the headings quantity of vocabulary, quality of vocabulary and summary.

Quantity of Vocabulary

Scoring Procedure. The results obtained were scored according to the procedures outlined in the manual of the Peabody Picture Vocabulary Test providing a mental age score (MA) which could be compared with the chronological age (CA) of the subjects.

Observations. As can be seen from Figure 4.5, the quantity of vocabulary understood by the subjects revealed a range in MA from 8.11 years to 15.9 years, when the CA ranged from 9.4 years to 10.11 years. The median was 10.8 years with the mean being 11.11 years. However the latter average includes one extremely high score. If this score is omitted, the average of the remaining subjects drops to 10.7 years. With the mean chronological age of the sample being 9.8 years, even the mean of the MA reflects ability to understand spoken vocabulary at their CA level with a marked tendency to comprehend beyond that level.

Within this sample there were two subjects who did not seem to fit the general pattern. Subjects A and I fell below their CA in

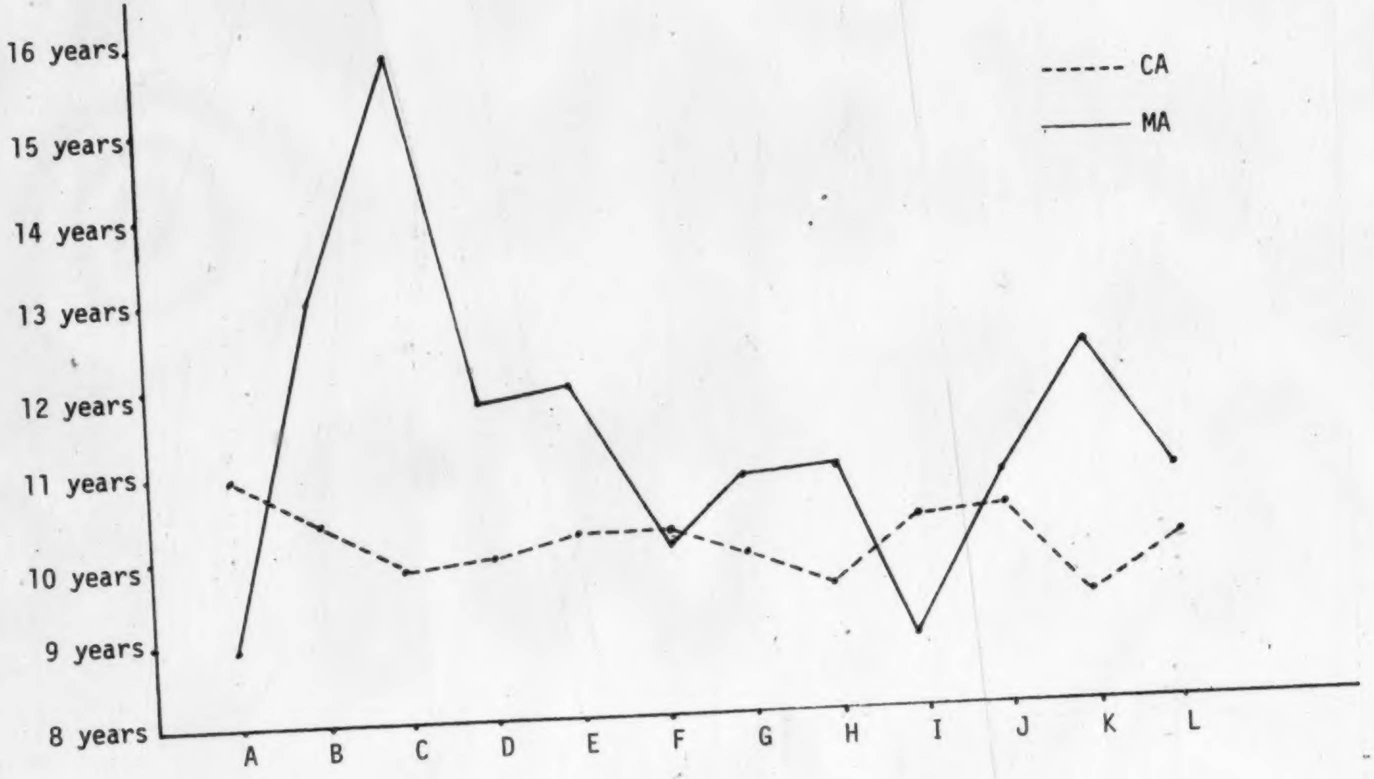


FIGURE 4.5

COMPARISON OF CHRONOLOGICAL AGE AND MENTAL AGE ON THE PEABODY PICTURE VOCABULARY TEST ability to understand vocabulary. This could indicate lack of general mental ability rather than a specific learning disability.

Discussion. Generally, the sample appears to follow the anticipated growth in quantity of vocabulary as outlined by Smith (1941) and Russell (1954). It also indicates that a repertoire of words is not the cause of their difficulties.

Quality of Vocabulary

Scoring Procedure. Rather than give a score for the type of meaning expressed, the meanings were classified according to the categories of meaning outlined by Feiffel and Lorge in their *Quantitative Analysis* (1950) (see Appendix B).

Observations. According to Tables 4.11 and 4.12 as well as Figures 4.6 and 4.7 one half of the subjects favor use and description when asked to explain a word while four subjects favored the use of synonyms as their first choice. However these latter subjects either were in error or chose a less mature category as their second choice for determining meaning (*demonstration and repetition* or *use and description*).

Almost half of the subjects had error as their second choice of category, though three subjects had a number of synonyms equal to their error responses (G, H, I).

Explanation was very rarely used by this sample. One subject (F) did use it as a second choice of category and another subject (E) used it as a third choice of category, equal with error.

TABLE 4.11

NUMBER OF RESPONSES PER CATEGORY WITH TOTAL RESPONSES FOR EACH SUBJECT

Subject	Use and Desc.	Demonstration	Error	Synonym	Explanation	Total Responses	% $\frac{UD + DR + Er}{TR}$
A	6*	3	2	3	0	14	78%
B	5	1	8	9*	3	26	54%
C	9*	7	1	5	2	24	71%
D	5	4	4	5	2	20	65%
E	2	5	3	9*	3	22	45%
F	9*	4	2	5	7	27	55%
G	9*	4	8	8	3	32	66%
H	8*	2	5	6	3	24	62%
I	6*	3	4	4	2	19	62%
J	3	4	5	9*	1	22	54%
K	6	8*	1	6	3	24	62%
L	5	3	5	7*	2	22	59%

*most number of responses in this category.

TABLE 4.12

ORDER OF PREFERENCE FOR CATEGORIES OF MEANING BY SUBJECTS

Subject	1st choice	2nd choice	3rd choice	4th choice	5th choice
A	UD	DR ⟷	S	Er	Expl
B	S	Er	UD	Expl	DR
C	UD	DR	S	Expl	Er
D	UD ⟷	S	DR ⟷	Er	Expl
E	S	DR	Er ⟷	Expl	UD
F	UD	Expl	S	DR	Er
G	UD	Er ⟷	S	DR	Expl
H	UD	Er ⟷	S	Expl	DR
I	UD	Er ⟷	S	DR	Expl
J	S	Er	DR	UD	Expl
K	DR	UD ⟷	S	Expl	Er
L	S	UD ⟷	Er	DR	Expl

UD: Use and description
DR: Demonstration, illustration, repetition
Expl: Explanation
S: Synonym
Er: Error
⟷: Equal

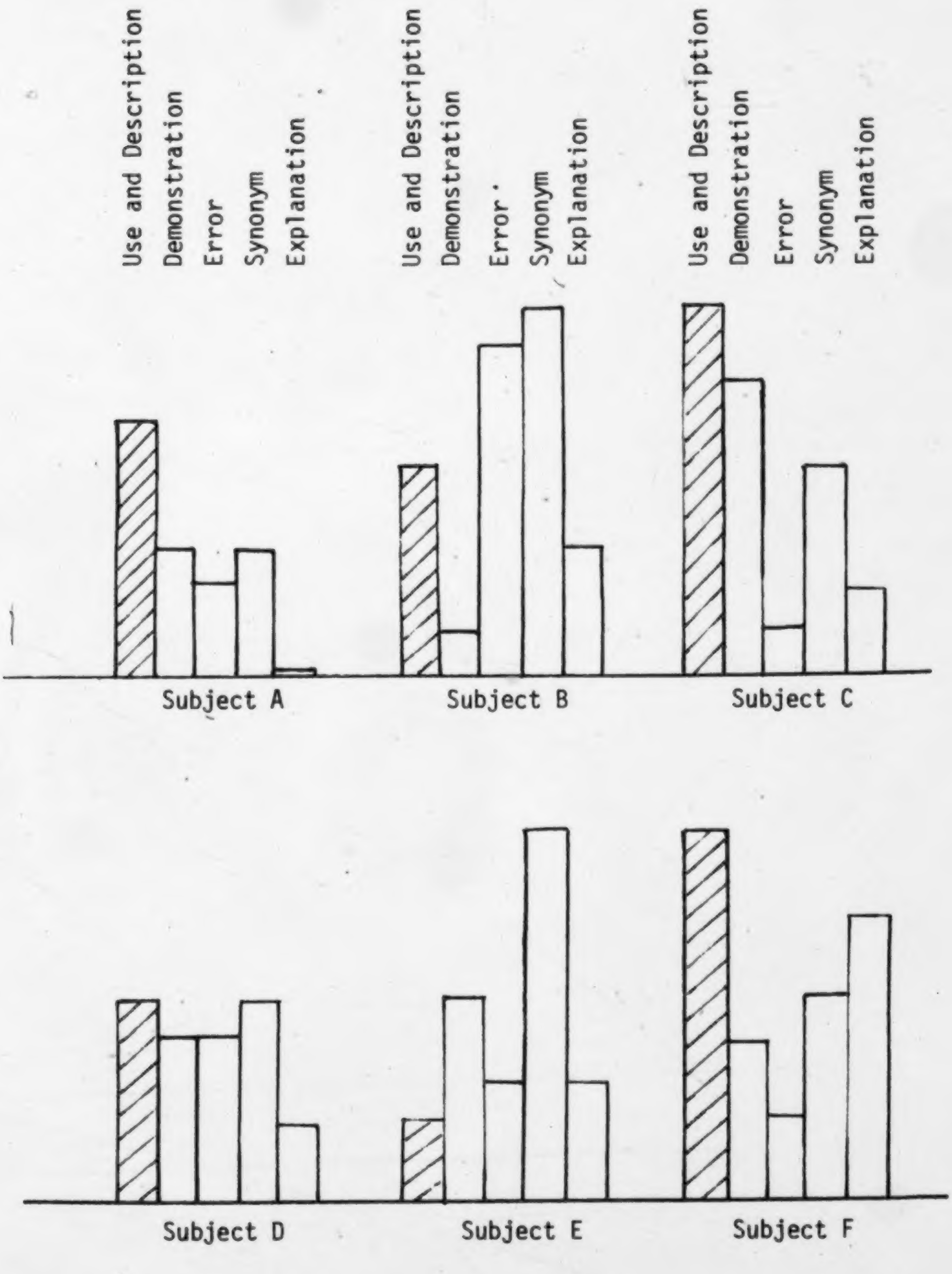


FIGURE 4.6

RESPONSE CLASSIFICATION FOR QUALITY OF VOCABULARY
(SUBJECTS A-F)

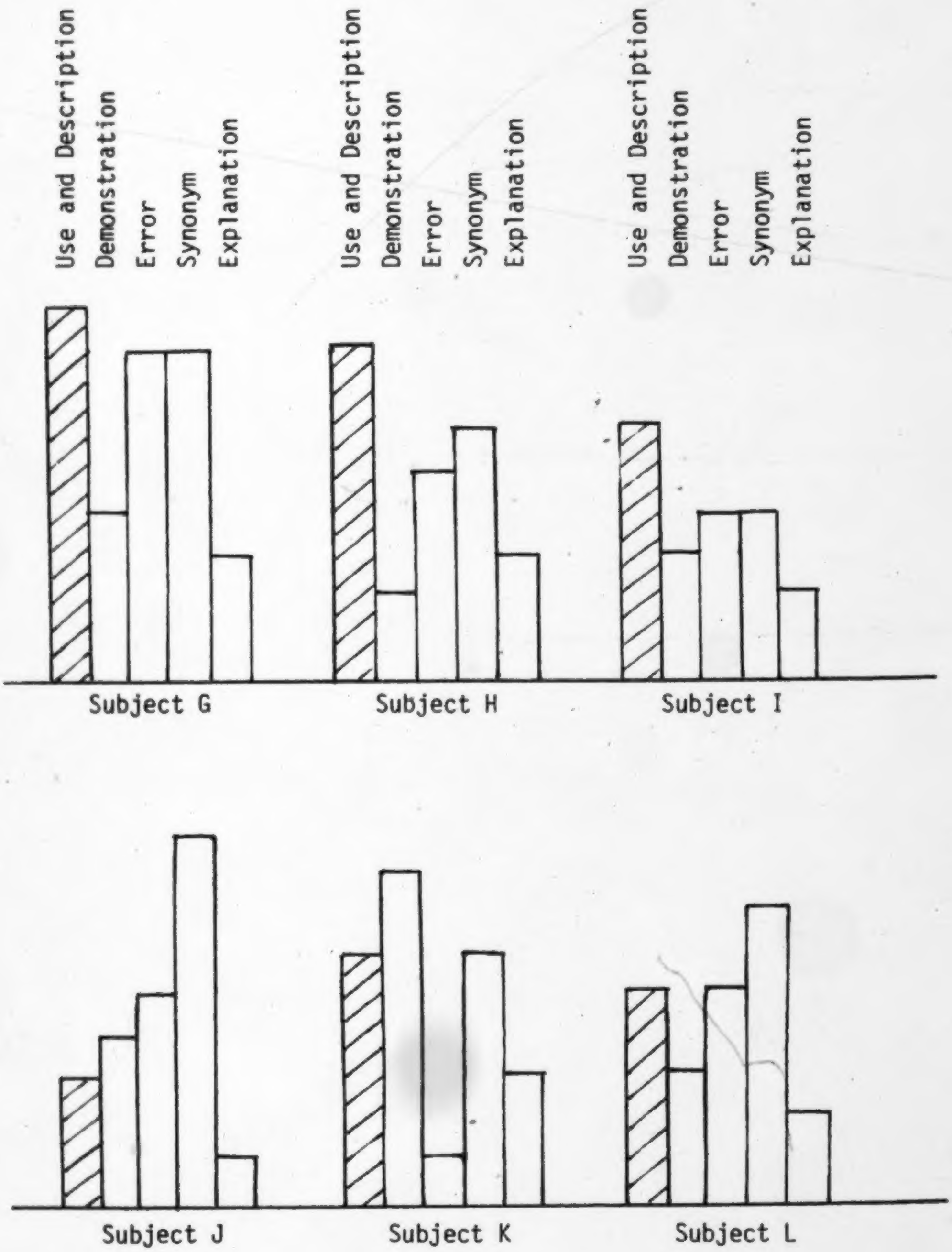


FIGURE 4.7

RESPONSE CLASSIFICATION FOR QUALITY OF VOCABULARY
(SUBJECTS G-L)

Discussion. Although the category of meaning, use and description, is used by eight to nine year olds it is much more widely used by six to seven year olds (Feiffel and Lorge, 1950). The preponderance of the use of this category by this sample seems to indicate that their quality of vocabulary falls below their chronological age level and below their mental ability to comprehend words.

Although some of the sample were beginning to make use of synonyms, they still tended to resort to less sophisticated categories if they did not have a synonym they could use.

The little use made of explanation could be anticipated since, according to Feiffel and Lorge, this is used by children older than this sample. Two of the subjects (E, F) did make some limited use of this category.

Examination of Table 4.11 reveals that the percentage of less sophisticated categories of meaning (use and description, demonstration, and error) constitute 54 percent to 78 percent of the total responses of each subject, except one, E, whose responses were constituted of only 45 percent of the less mature categories.

The lack of quality in vocabulary has previously been observed to correlate with poor reading ability (Grant, 1965; Jackson, 1968). Grant found that poor readers were more concrete in their responses and frequently employed perceptual properties. Jackson observed the descriptive type of response rather than a conceptual reply by the low reading group. The subjects within this study manifest the same limitations as poor readers observed in earlier research.

Some of the characteristics of vocabulary growth pinpointed by Grant (Chapter II) were also observed in this study. The concrete orientation was much in evidence in quality of vocabulary. Some errors were due to similarity of sound or clang association (Feiffel and Lorge, p. 9) demonstrated by lecture which was variously defined as

> electrocute
> a government can lecture you
> when you're voting for somebody you want somebody to win.

Few synonyms or class inclusions were used. According to the research these factors suggest immaturity because they are more typical of younger children.

It appears that the subjects are handicapped by an inability to move away from the concrete as well as being unable to distinguish similar sounds adequately. Both of these deficits may be due to lack of cognitive development but may also be due to lack of familiarity with the concepts represented in the vocabulary. Insufficient time spent developing meaning forces the child to focus on the task of decoding. The time spent may only be insufficient for certain types of learners but when they lack a range of referents they are restricted to the immediate.

Summary

It would appear from the above data that as a group these students reveal ability to understand words at or beyond their age level but their vocabulary lacks depth and breadth. The quality of word knowledge remains at a very concrete stage with perceptual and functional attributes predominant. The concepts held by the subjects are restricted and have limited transferability.

THE UTILIZATION OF CRITERIAL PROPERTIES

In the analysis of the quality of vocabulary it became apparent that the subjects used a particular frame of reference when defining words, confining themselves to narrow semantic space. In consequence the question arose as to the kind of criterial properties they would select to identify and classify experience.

Scoring Procedure

Scoring was accomplished by having three judges classify the descriptions under the categories of meaning outlined by Siemens (1973), a copy of which can be found in Appendix B.

Observations

From Figure 4.8 it is evident that the percentage of categories of meaning used is low, ranging from 15 percent to 40 percent in this sample. Some criterial attributes were used far more than other categories of meaning. The three most used categories of meaning were color (used by all subjects), part-whole (used by all but one subject), and size (used by ten of twelve subjects). The next favoured categories were use, texture and qualities while taste, small, variety of context, synonym, connotative, and concept of which it is a part were never used (Table 4.13 and Figure 4.9).

The use of additional criterial properties was evident when use was accepted on a single appearance in the three descriptions. According to Table 4.11 and Figure 4.10 there is a wider range of

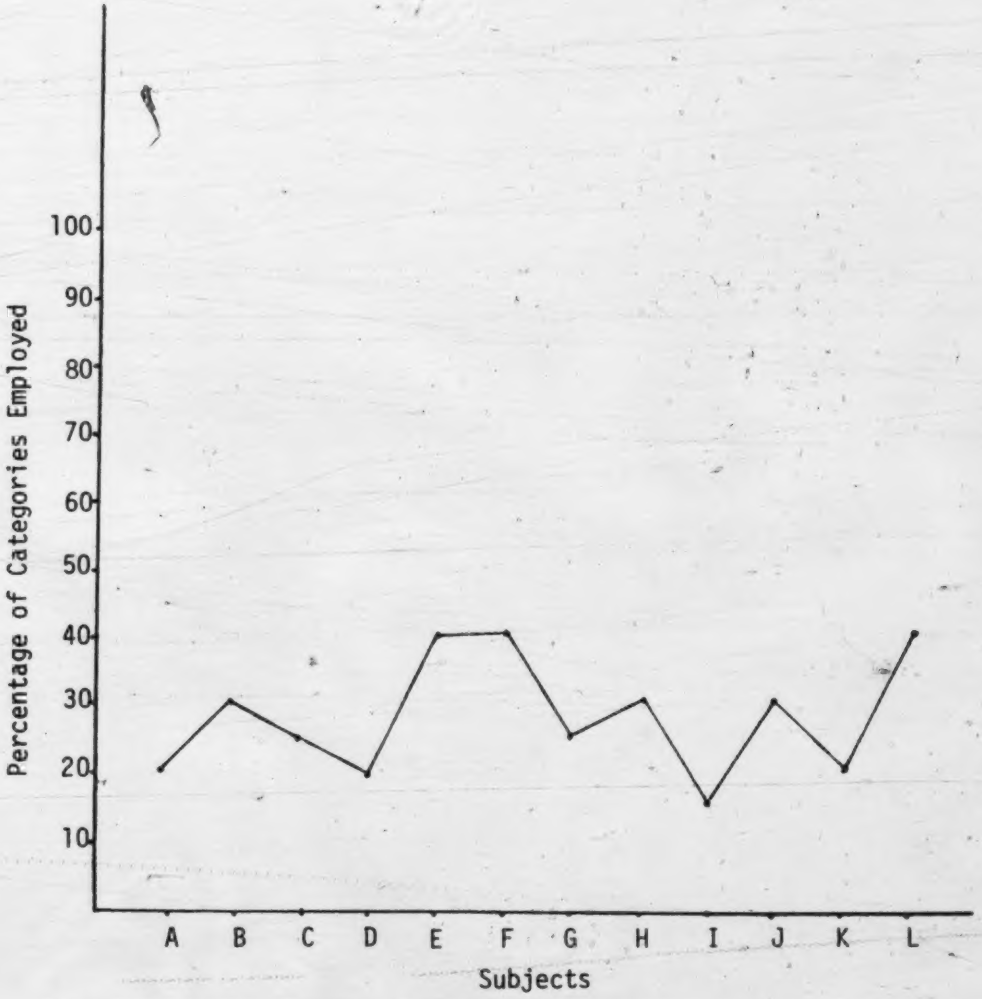


FIGURE 4.8

PERCENTAGE OF USE OF POSSIBLE NUMBER
OF CATEGORIES OF MEANING

TABLE 4.13

CATEGORIES OF MEANING EMPLOYED FOR TWO OF THREE DESCRIPTIONS

	Subject											
Category	A	B	C	D	E	F	G	H	I	J	K	L
Color	*	*	*	*	*	*	*	*	*	*	*	*
Shape	*		*			*						*
Size	*		*	*	*	*	*	*		*	*	*
Texture		*		*		*	*	*		*		
Composition		*							*	*		
Weight		*										
Taste												
Smell												
Sound												
Actions					*							
Qualities			*		*	*	*					*
Use		*				*		*	*	*	*	*
Function						*						*
Part-whole	*	*	*	*	*	*	*	*		*	*	*
Where lives												
Class name					*	*						*
Context												
Synonym												
Connotative												
Concept of which a part												

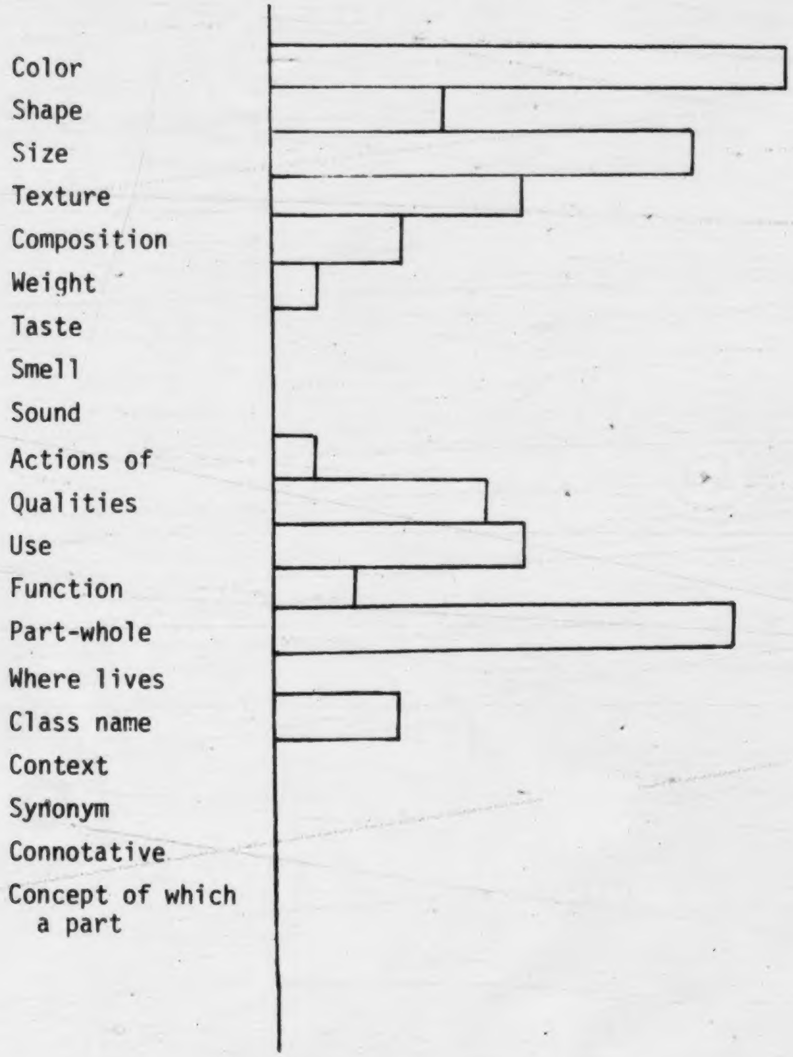


FIGURE 4.9

UTILIZATION* OF CATEGORIES OF MEANING BY TWELVE SUBJECTS

(*Utilization equals used to describe two of three objects.)

TABLE 4.14

CATEGORIES OF MEANING EMPLOYED AT LEAST ONCE IN THE DESCRIPTIONS

	Subject											
Category	A	B	C	D	E	F	G	H	I	J	K	L
Color	*	*	*	*	*	*	*	*	*	*	*	*
Shape	*	*	*				*	*	*	*	*	*
Size	*	*	*	*	*	*	*	*		*	*	*
Texture	*	*	*	*		*	*	*		*	*	*
Composition		*		*	*	*	*	*	*	*		*
Weight		*									*	
Taste												
Smell												
Sound												
Actions				*	*	*	*	*	*	*	*	*
Qualities	*	*	*		*	*	*			*	*	*
Use	*	*	*			*		*	*	*	*	*
Function		*	*		*	*				*	*	*
Part-whole	*	*	*	*	*	*	*	*	*	*	*	*
Where lives									*			
Class name		*		*	*	*				*	*	*
Context	*		*			*					*	
Synonym												
Connotative												
Concept of which a part												

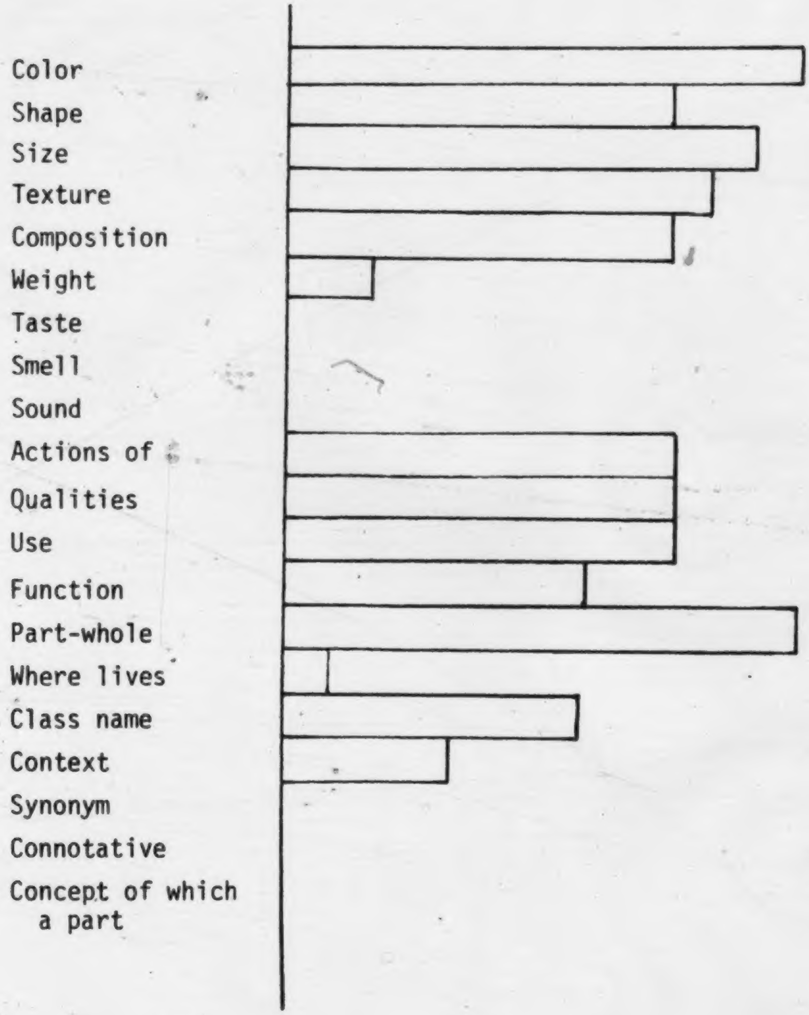


FIGURE 4.10

UTILIZATION* OF CATEGORIES OF MEANING
BY TWELVE SUBJECTS

(*Utilization equals used to describe one object.)

categories of meaning being utilized. Texture, composition, actions of, qualities, uses and class name appear. However color, size and part-whole relationships remain predominant.

Discussion

It would appear that there is a dependency on the perceptual attributes. Bruner (1966) observed this tendency to be the inclination of a younger child than those in this sample. It is evident that they are also depending on functional features, a further inclination of a younger child, though a few class names were given (Bruner's superordinate concepts).

Nixon (1976) found the favoured categories of meaning (color, use, part-whole) were generally used by 6-6½ year olds, with the categories of texture, smell, qualities and function being added by eight year olds.

Although in Nixon's study weight was not much in evidence as a criterial attribute until 11-11½ years, Subject B in this study made extensive use of this category because in his life experience it is an important factor. This emphasizes the role of experience which Nixon found permitted younger children to use categories of meaning not normally used by their age group.

In both of the earlier studies (Nixon, 1976; Siemens, 1973) the number of categories of meaning increased on the auditory cue. However in this sample there was either no change in the range of categories or a decrease. This could reflect either lack of experience or the inability of the subjects to utilize experience.

Summary

From the above discussion it appears that these subjects though older chronologically are not as mature in their use of criterial properties. They depend on criterial attributes generally employed by 6-8 year olds, occasionally using weight, location and class names. The categories of meaning most favoured are perceptual in nature, suggesting an inability to move away from the concrete and seem to indicate a delay in cognitive development.

THE EMERGENCE OF THE ABILITY TO CONSERVE

The acquisition of invariant concepts in conservation reveals the movement of the individual along the continuum of cognitive development. Since such movement governs the extent of learning it was essential to examine the nature of its development in the disabled reader. This was accomplished by examining the ability of the sample to conserve quantity of substance, weight and volume.

The findings are discussed under the headings concrete conservation, stories conservation, comparison of concrete conservation and stories conservation, and the nature of the explanations.

Concrete Conservation

Procedure. Through the manipulation of concrete objects and questioning (see Appendix A) the level of conservation attained was determined. Each decision was scored 0 for a non-conserving decision and 1 for a conserving decision.

Observations. According to Figure 4.11 all the subjects were able to conserve substances to Level 2. Though unable to conserve at the earlier levels, two subjects did conserve at Level 3. The balance of the sample were able to conserve through the three levels.

Weight was conserved by one half of the sample (Figure 4.12), four of whom also conserved substance through to an equal level (F, H, J, K). The remaining half of the subjects showed a rather fragmented understanding, with one unable to complete the tasks at all.

As would be anticipated from research (Table 2.2) the conservation of volume was less well understood. Figure 4.13 reveals that four subjects (E, F, G, L) were unable to conserve volume at all, with three other subjects (A, H, I) able to conserve through the levels of complexity. The remaining subjects (B, C, D, J, K) appear to be in a transition stage, sometimes conserving but often still uncertain.

Discussion. Conservation of quantity does demonstrate the pattern of growth outlined in earlier research (Table 2.2) but there appears to be a delay in its acquisition.

By the age of 7 and 8 years the conservation of substance has usually been established. Although some of this sample have attained this level of development, they are 9 and 10 years of age, and for fifty percent of the group conservation is still transitory.

It can also be observed that the general pattern of ability in conservation of weight tends to be more fragmented than for substance, perhaps indicating it is a more difficult task and confirming its later acquisition (Table 2.2). However, like substance,

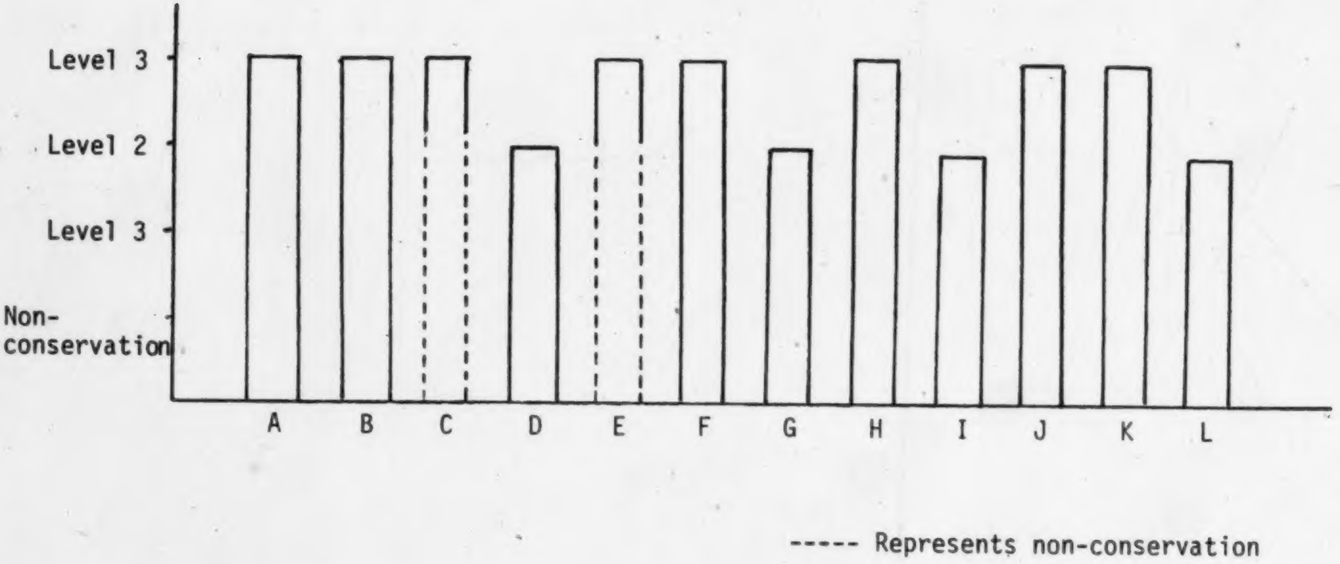
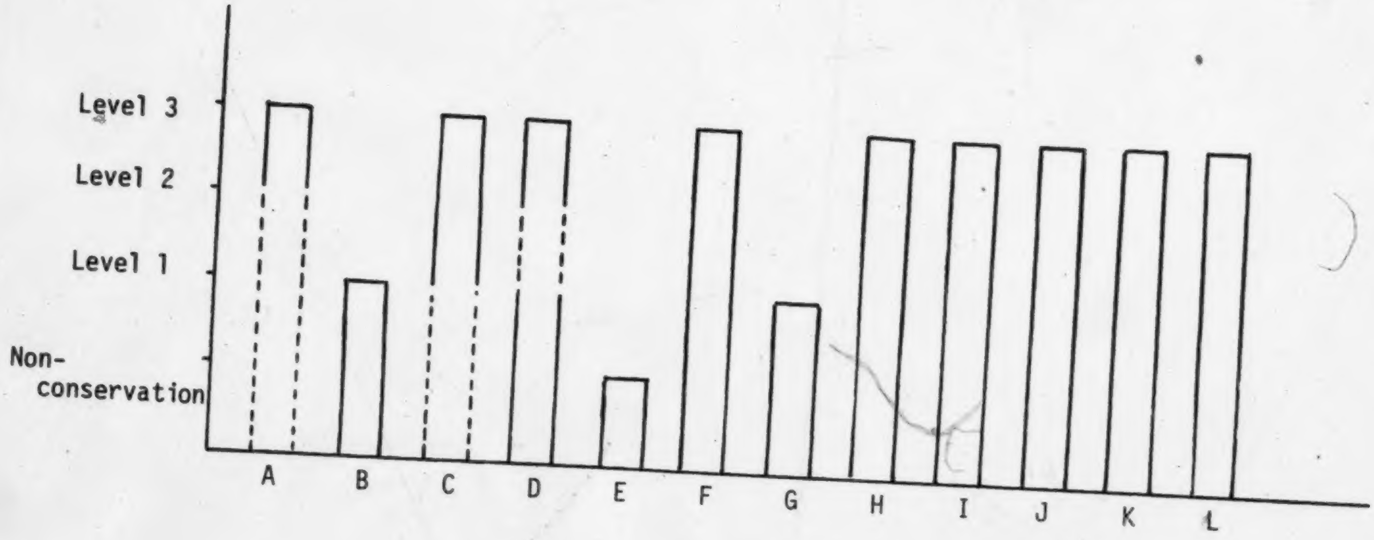


FIGURE 4.11

LEVELS OF RESPONSES FOR CONCRETE CONSERVATION OF SUBSTANCE



--┼-- Represents non-conservation

FIGURE 4.12

LEVELS OF RESPONSES FOR CONCRETE CONSERVATION OF WEIGHT

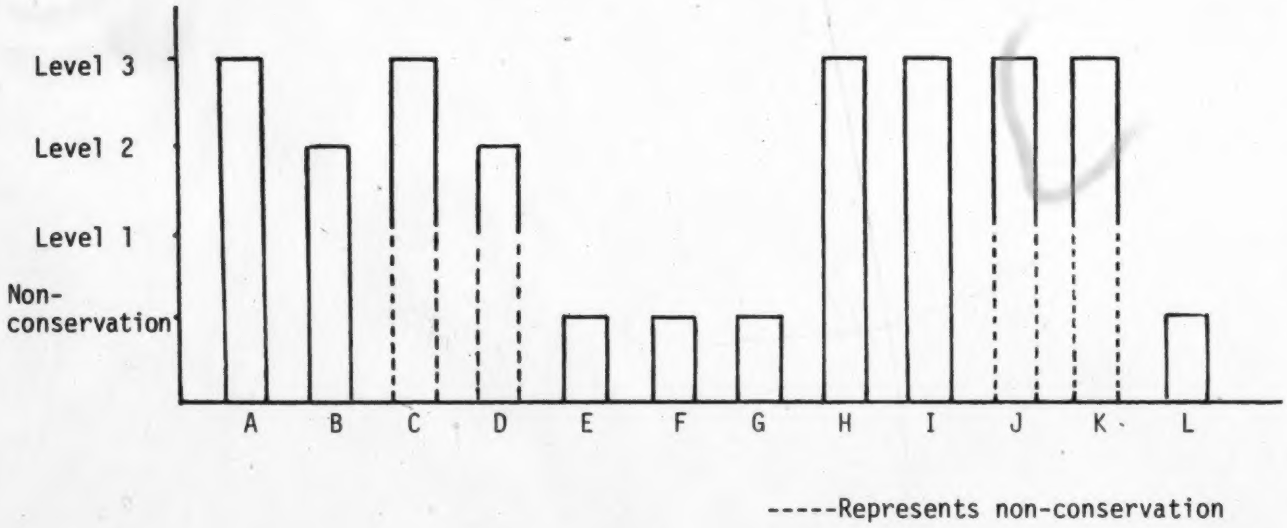


FIGURE 4.13

LEVELS OF RESPONSES FOR CONCRETE CONSERVATION OF VOLUME there seems to be evidence of delay in acquisition of this invariant for the subjects are at or above the chronological age at which it is usually attained.

As would be expected volume is less well handled than either of the other two areas. The fact that some could conserve volume suggests ability to understand certain aspects of conservation at or beyond their chronological age level.

Of the twelve subjects only one (H) has achieved conservation of quantity through to volume. The remaining subjects provide evidence wherein the individual "tentatively hypothesizes conservation for some transformations but denies it for others" (Flavell, 1963, p. 299). This would seem to indicate a lag of one to two years in the sample's ability to conserve quantity.

Stories Conservation

In order to be able to compare the ability to conserve concretely with the ability to conserve when acquiring information for conservation from a story, another set of tasks was administered to the sample.

Procedure. The tasks were administered as outlined in Chapter III and Appendix A. The responses were scored in the same manner as the responses for concrete conservation, 0 for non-conservation and 1 for a conserving decision.

Observations. Conservation of substance in stories conservation was achieved by only four subjects (Figure 4.14). Two of the sample conserved to Level 2, otherwise there was a scatter among the

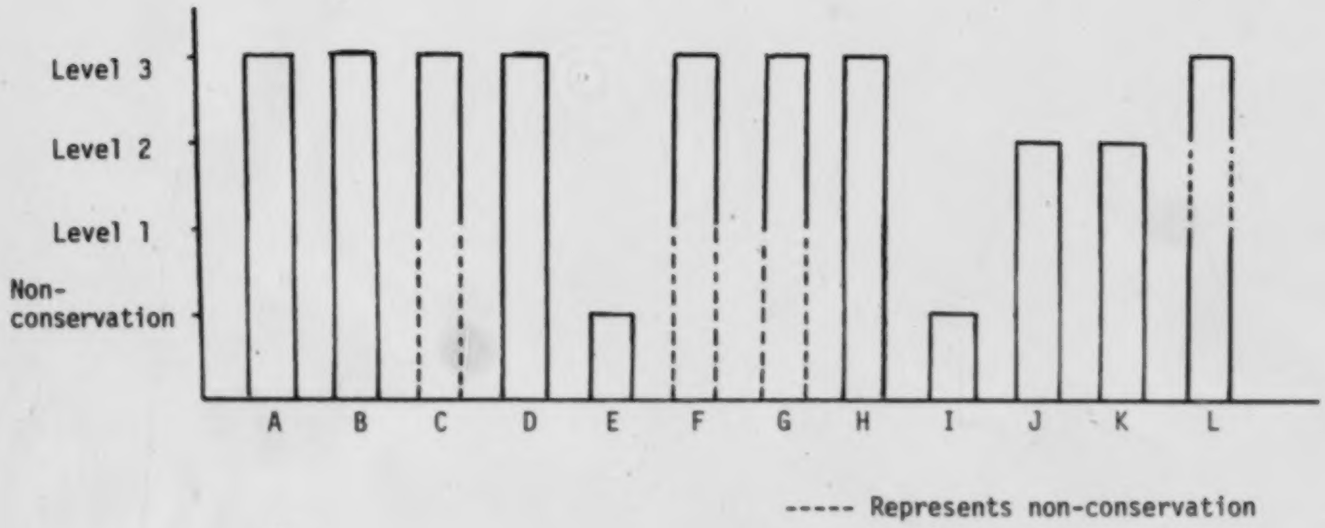


FIGURE 4.14

LEVELS OF RESPONSES FOR STORIES CONSERVATION OF SUBSTANCE levels of complexity but not necessarily in sequence.

As in concrete conservation, weight was not as well mastered as substance (Figure 4.15). Only one subject was able to conserve through to Level 2. Much scatter was evident.

Volume was more poorly commanded in stories conservation than concrete conservation (Figure 4.16). Two subjects (J, K) could conserve to Level 2 but as a group there appeared to be a general lack of development in this area.

Discussion. Throughout stories conservation the subjects appeared to be unable to conserve consistently when using representation. Either the invariants are not sufficiently established to permit selection of pertinent detail from the story or there is lack of labels and an expressive tool or an overload of information interferes with discrimination of relevant information. It is obviously a more difficult task, as Rawson (1969) contended.

Comparison of Concrete Conservation and Stories Conservation

When comparing the two areas of conservation it can be observed that the more remote examples represented in stories conservation are not as consistently comprehended as the concrete tasks of conservation.

An examination of Figures 4.11 and 4.14 reveals that three subjects (A, B, H) were able to conserve substance through all the levels in both concrete conservation and stories conservation. Three more of the sample conserved through all the levels in concrete conservation but were unable to perform at all levels in the stories

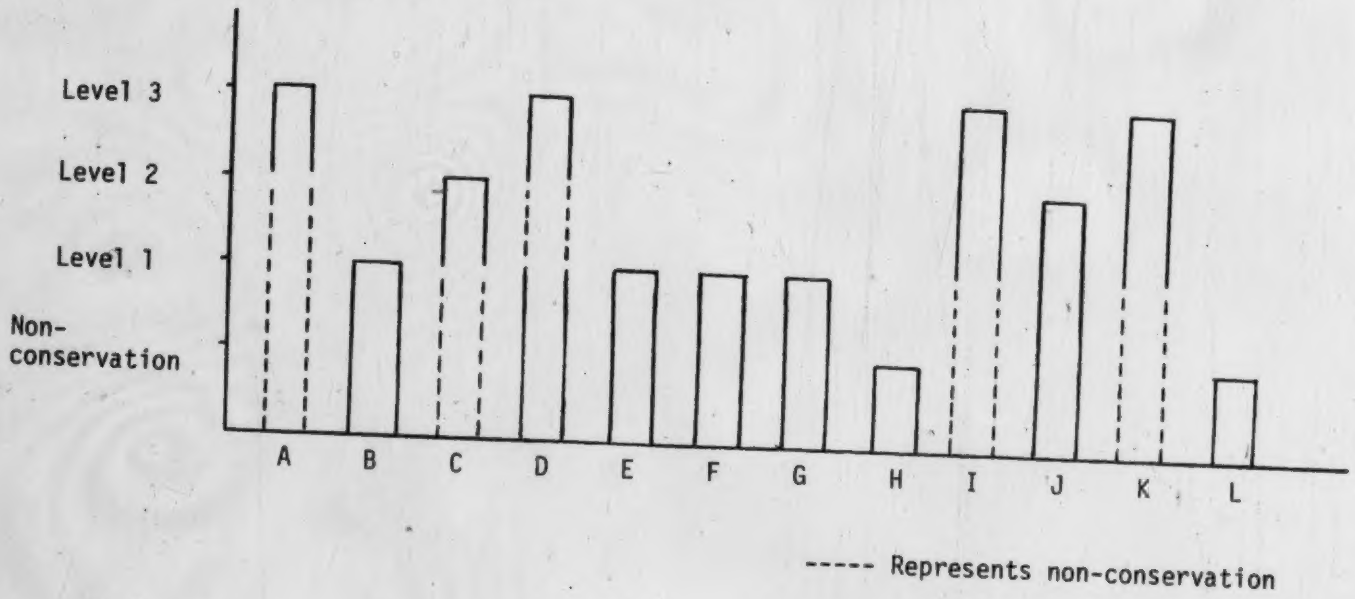


FIGURE 4.15

LEVELS OF RESPONSES FOR STORIES CONSERVATION OF WEIGHT

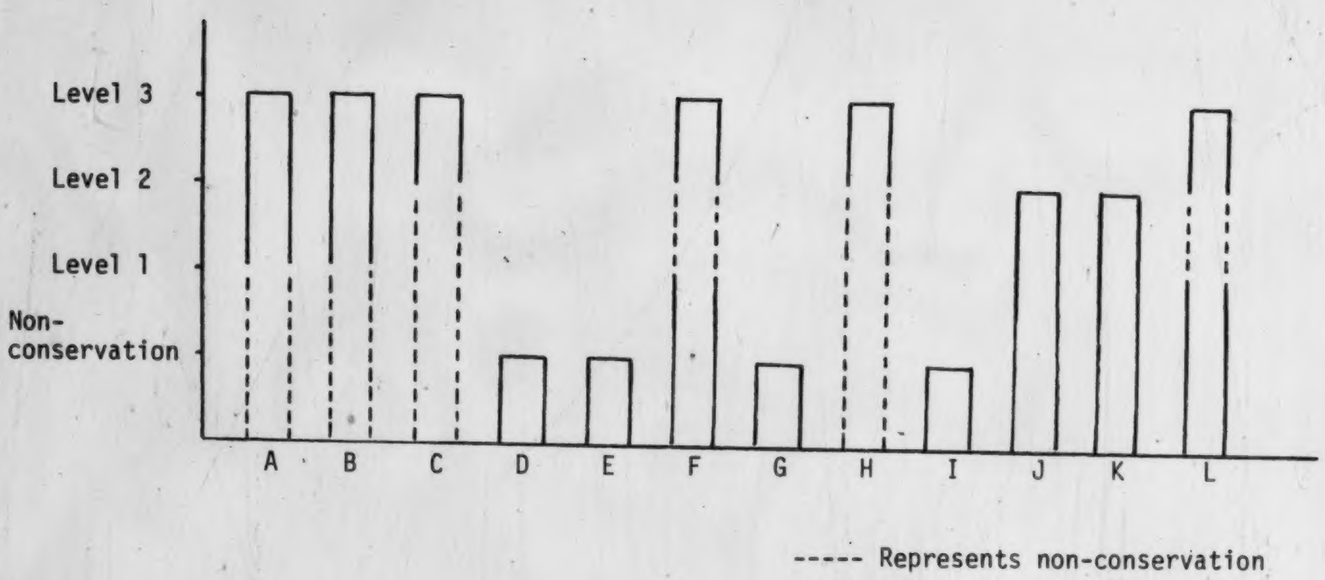


FIGURE 4.16

LEVELS OF RESPONSES FOR STORIES CONSERVATION OF VOLUME conservation task. One subject (D) reached a higher level of complexity in stories conservation than concrete conservation. The remaining members of the sample exhibit scatter through the levels or non-conservation.

When comparing Figures 4.12 and 4.15 it can be noted that weight is more readily conserved at the concrete level. Though some scatter is evident in concrete conservation it is even more prevalent in stories conservation. Those who had achieved through all levels in concrete tasks were unable to attain such a developmental pattern in the stories task.

Fragmentation is particularly evident in conservation of volume (Figures 4.13 and 4.16). One subject achieved conservation one level lower in stories conservation than concrete conservation. Another subject was consistently unable to conserve. Generally conservation of volume has not been acquired.

Summary. From the above discussion it is apparent that the tasks in the stories conservation proved to be a more complex process than the concrete conservation tasks. In both areas there appears to be a lack of organization or integration between the levels of complexity for several subjects. This may be better understood by an examination of the nature of the explanations offered by the subjects when they were asked to support their decision for or against conservation.

The Nature of the Explanations

Procedure. Within the instrument design used above was provision for an explanation of the decision for conservation or non-conservation. The rationales given further illumine the cognitive development of the sample.

Each explanation was classified as logical, perceptual or non-logical/non-perceptual, the latter including the inability to offer an explanation. A logical explanation supported a decision for conservation, for example,

> if none was wasting it would be the same, like none fell apart from it. It'd be just the same. (Subject F)

The perceptually-bound response corresponded to the following:

> well, they'd have to be pretty small for the shapes and everything . . . the muff's sort of small. (Subject C)

whereas a non-logical/non-perceptual response usually rambled, made little sense or was simply "I don't know."

Observations. The types of explanation given in concrete conservation are shown in Tables 4.15, 4.16 and 4.17 as well as Figures 4.17, 4.18, and 4.19.

In the explanations for conservation of substance the number of logical responses decreased with increasing complexity, simultaneously the perceptual and non-logical answers tended to increase with increasing complexity. Although this general pattern could be seen, there were five subjects who sometimes were able to offer a logical explanation at a higher level of complexity and on a task usually acquired later. For example, Subject C was unable to explain conservation of substance beyond a perceptual level (Figure 4.17)

TABLE 4.15

SUMMARY OF RESPONSES FOR EXPLANATION OF CONCRETE CONSERVATION OF SUBSTANCE

Level	Logical	Perceptual	NP/NL
1	6	4	2
2	8	3	1
3	2	5	5

TABLE 4.16

SUMMARY OF RESPONSES FOR EXPLANATION OF CONCRETE CONSERVATION OF WEIGHT

Level	Logical	Perceptual	NP/NL
1	8	1	3
2	5	2	5
3	5	4	3

TABLE 4.17

SUMMARY OF RESPONSES FOR EXPLANATION OF CONCRETE CONSERVATION OF VOLUME

Level	Logical	Perceptual	NP/NL
1	5	0	7
2	5	3	4
3	3	2	7

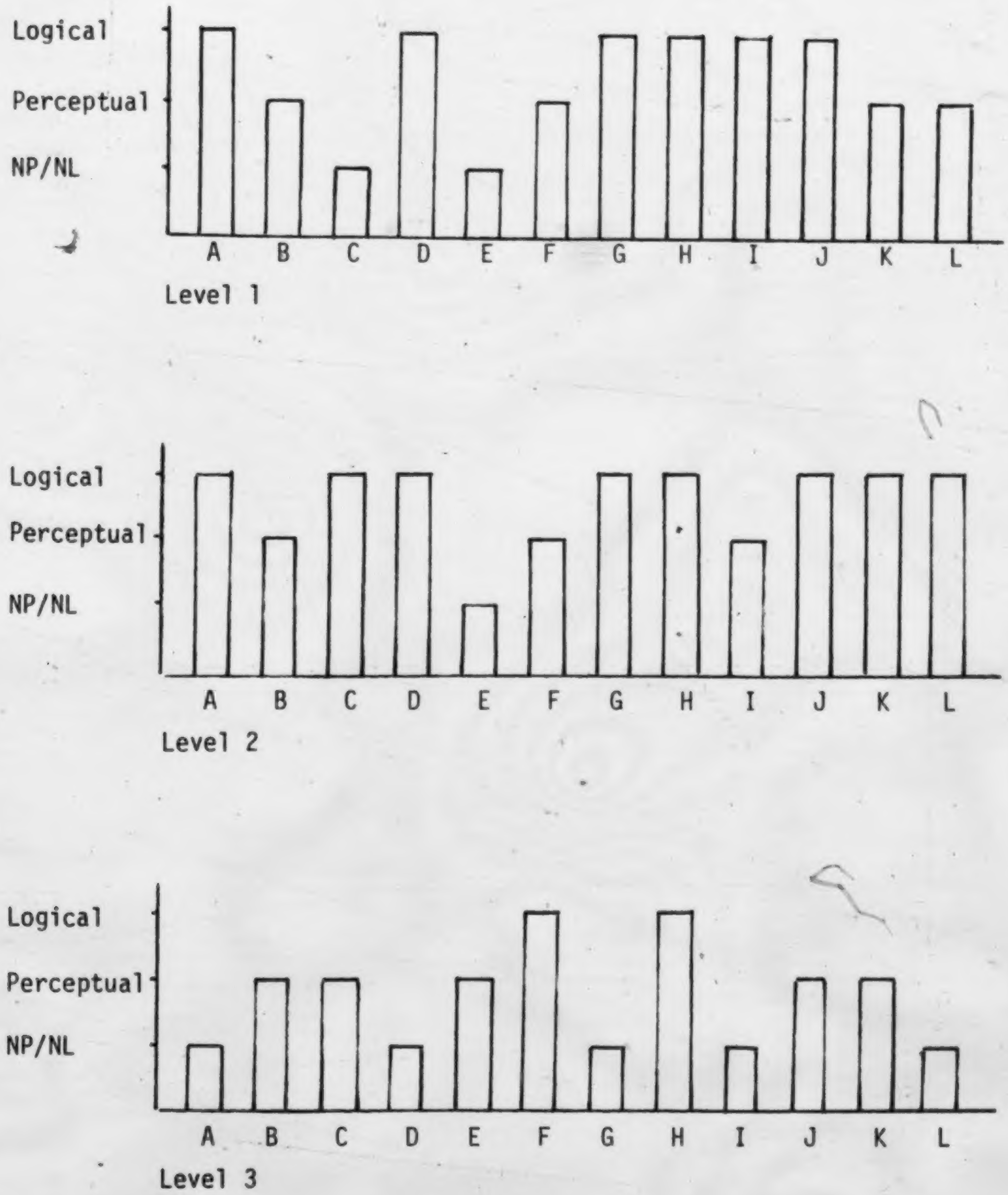
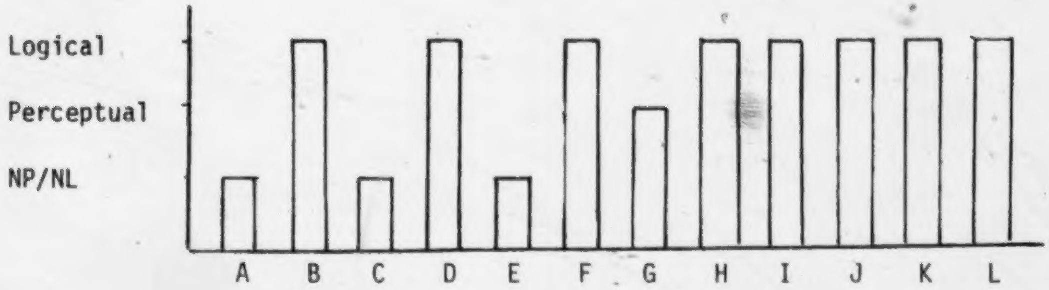
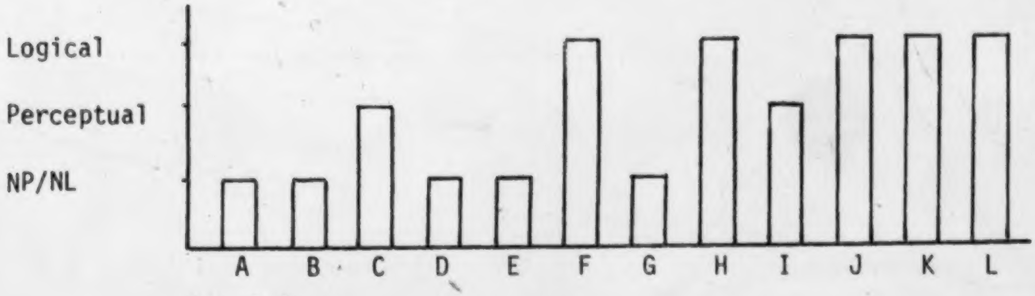


FIGURE 4.17

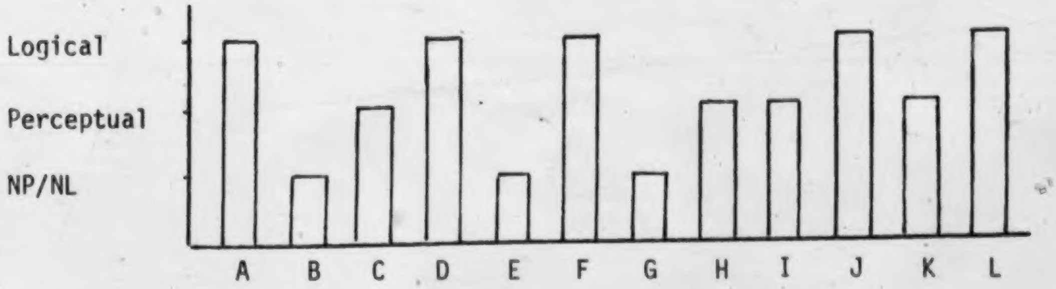
PATTERN OF RESPONSES FOR EXPLANATION OF CONCRETE CONSERVATION OF SUBSTANCE



Level 1



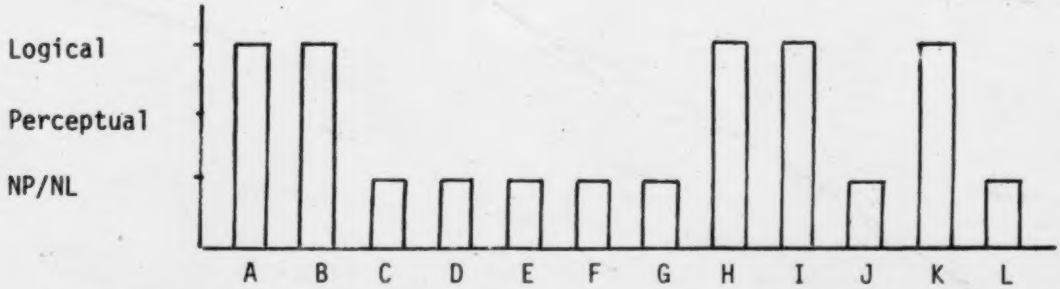
Level 2



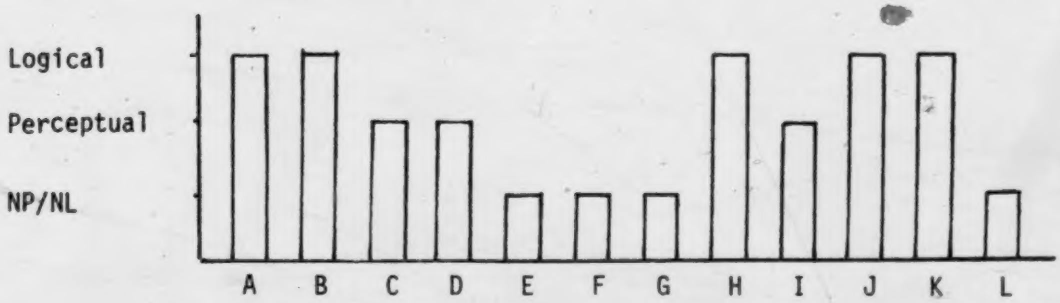
Level 3

FIGURE 4.18

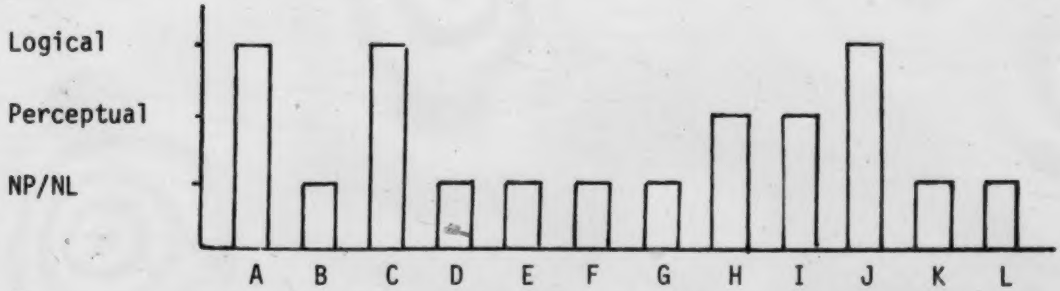
PATTERN OF RESPONSES FOR EXPLANATION OF CONCRETE CONSERVATION OF WEIGHT



Level 1



Level 2



Level 3

FIGURE 4.19

PATTERN OF RESPONSES FOR EXPLANATION OF CONCRETE CONSERVATION OF VOLUME but gave a logical explanation for volume, Level 3 (Figure 4.19).

In concrete conservation of weight the logical answers decreased with increasing complexity, the number of perceptual responses increased with increasing complexity and non-logical/non-perceptual answers were highest at Level 2 (Table 4.16, Figure 4.18).

Figure 4.16 demonstrates that more subjects revealed a decreasing ability to explain with increasing complexity in conservation of weight. However there were three subjects (A, C, D) who were able to explain at higher levels of complexity, though they could not explain lower levels.

The more remote concept of volume in concrete conservation showed a marked decline in ability to explain a decision. It appeared to be either known or not known with the perceptual factors much less influential (Figure 4.19).

In stories conservation perceptual factors were less predominant in the responses throughout substance, weight and volume (Tables 4.18, 4.19, 4.20; Figures 4.20, 4.21, 4.22). This is probably due to the lack of objects, for the information for conservation had to be imaged from the story rather than being directly available.

Figures 4.20, 4.21, and 4.22 show that in stories conservation most subjects were unable to explain their decision. In substance and weight logical explanations were more evident at Levels 2 and 3 whereas these levels of complexity had the more non-logical explanations in volume (Tables 4.18, 4.19 and 4.22).

TABLE 4.18

SUMMARY OF RESPONSES FOR EXPLANATION OF STORIES CONSERVATION OF SUBSTANCE

Level	Logical	Perceptual	NP/NL
1	3	2	7
2	6	2	4
3	5	0	7

TABLE 4.19

SUMMARY OF RESPONSES FOR EXPLANATION OF STORIES CONSERVATION OF WEIGHT

Level	Logical	Perceptual	NP/NL
1	1	0	11
2	4	0	8
3	4	0	8

TABLE 4.20

SUMMARY OF RESPONSES FOR EXPLANATION OF STORIES CONSERVATION OF VOLUME

Level	Logical	Perceptual	NP/NL
1	3	1	8
2	2	1	9
3	2	1	9

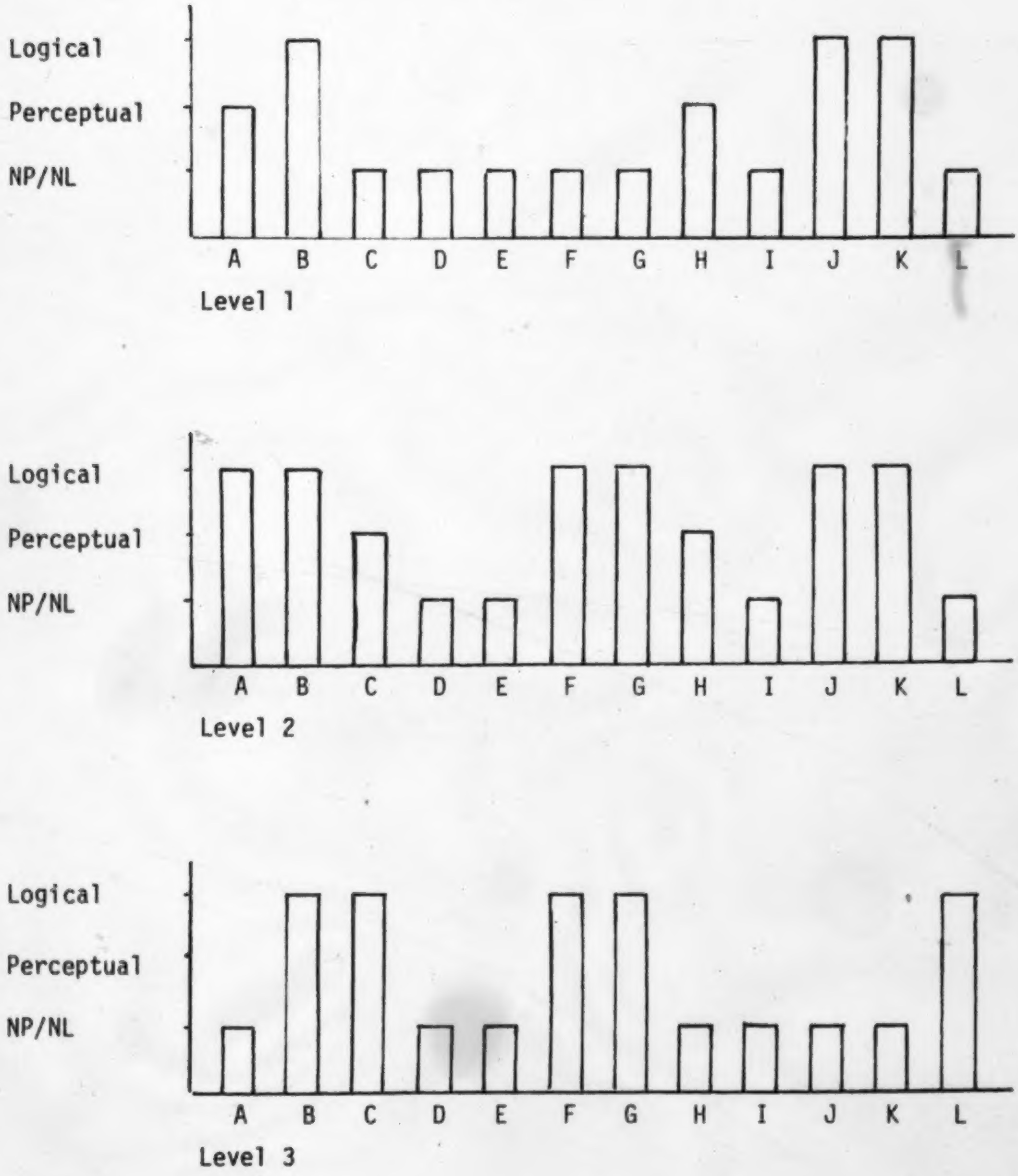
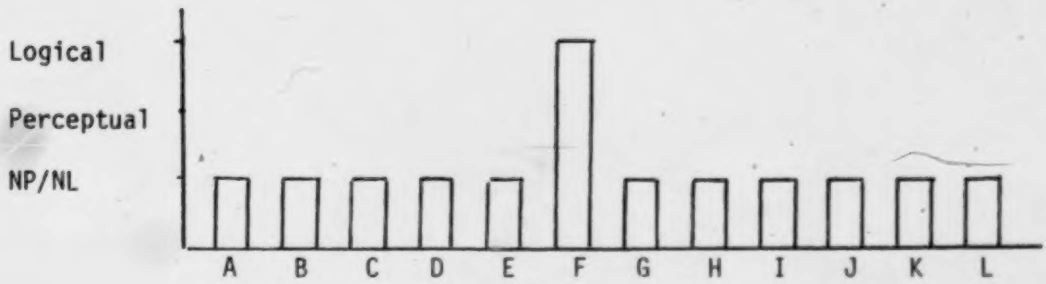
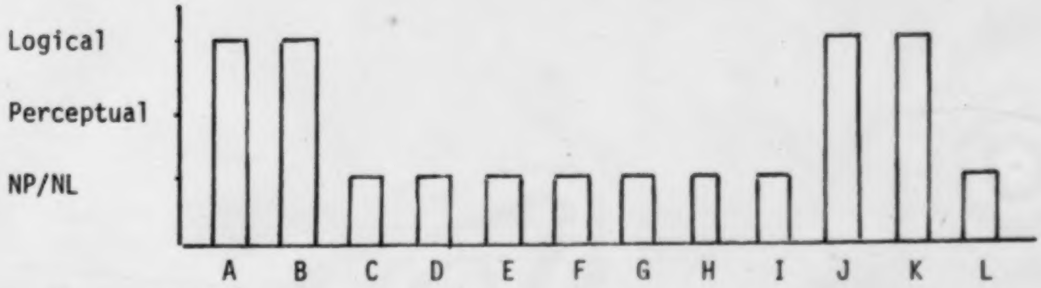


FIGURE 4.20

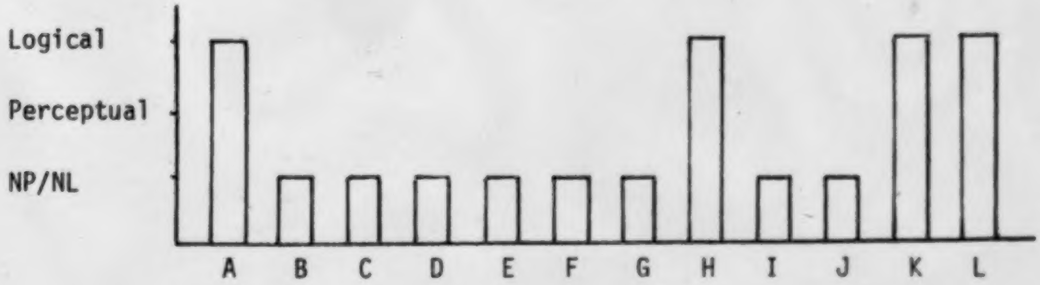
PATTERN OF RESPONSES FOR EXPLANATION OF STORIES CONSERVATION OF SUBSTANCE



Level 1



Level 2



Level 3

FIGURE 4.21

PATTERN OF RESPONSES FOR EXPLANATION OF STORIES CONSERVATION OF WEIGHT

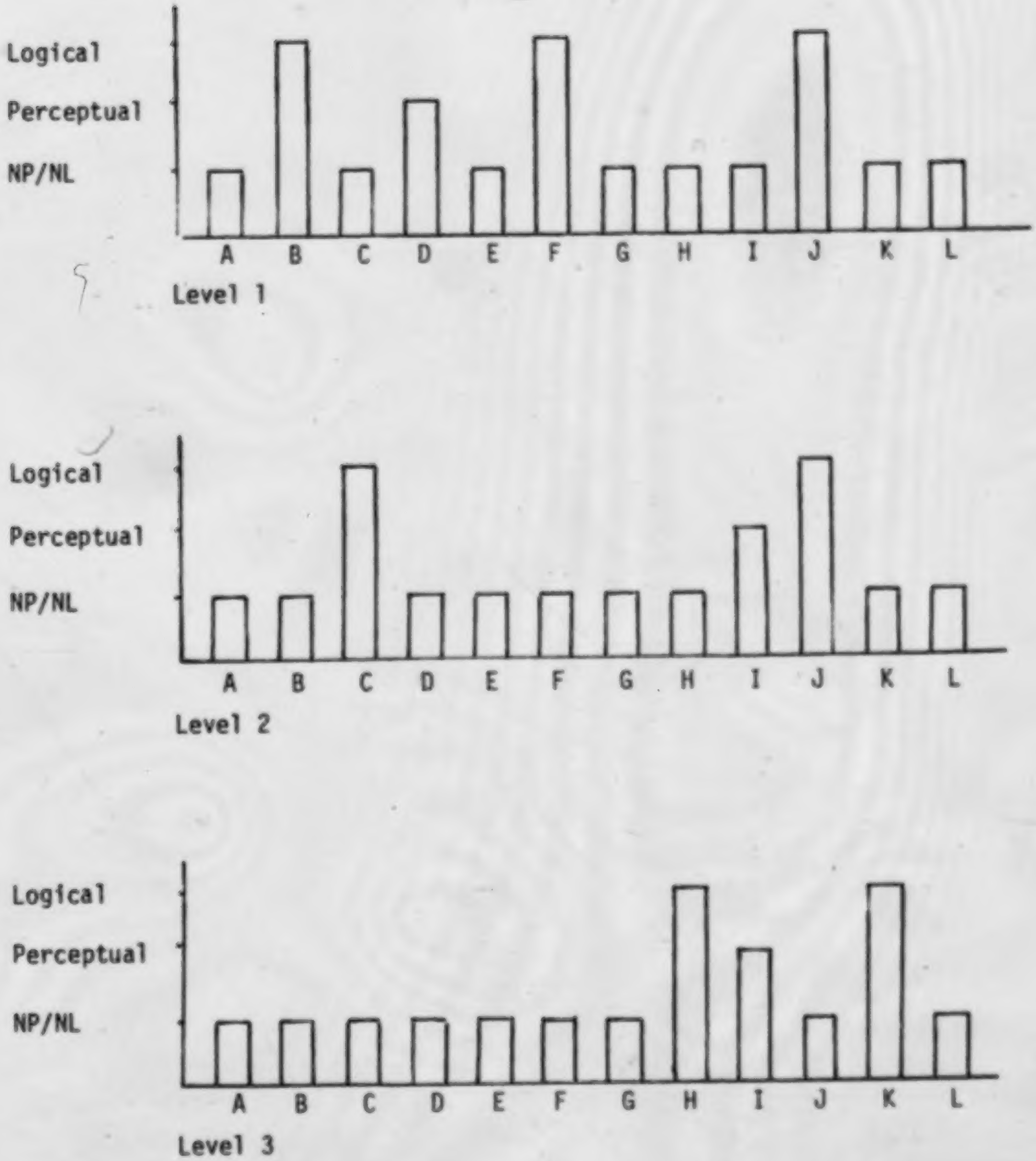


FIGURE 4.22

PATTERN OF RESPONSES FOR EXPLANATION OF STORIES CONSERVATION OF VOLUME

Discussion. It would appear from the above observations that explaining what is visible and concrete is a more simple task than to image and explain what is presented verbally. The latter demands a fund of concepts which are labelled and classified in order to provide for their manipulation.

This sample demonstrates a marked inability to deal with information presented through representation, as in a code or verbal presentation. If the problem can be demonstrated concretely they can comprehend and explain what is taking place. However this again depends on the remoteness of concept (e.g. volumes, concrete conservation).

Summary. Although concrete conservation is taking place, it appears to be delayed by 1 to 2 years when compared with the anticipated emergence of this ability. Conservation was less well managed when information for conservation had to be drawn from stories. Both aspects of conservation demonstrated fragmentation in acquisition with perceptual bias evident in concrete conservation. Increasing complexity and remoteness in both areas of conservation yielded a decrease in logical explanations.

SUMMARY OF FINDINGS

This study was designed to explore the learning patterns of the disabled reader. Each task revealed specific developmental lags as outlined below.

1. In oral reading there appeared to be an inability to utilize the linguistic constraints of syntax and semantics. The

syntax used pertained to either the beginning of the sentence or to the passage. When the children of the sample depended on the beginning of the sentence the meaning rarely related to the rest of the thought unit or to the total passage. Consequently comprehension was limited. Better comprehension was evident with selection of a word which was associated with the whole passage, though key changes in meaning were lost as details within the sentences were overlooked. Semantics caused even more difficulty, the responses selected bearing little or no relation to the text.

2. The oral language of the subjects was expressed in kernel sentences with word production in the Grade 1 range and T-unit maturity at the Grade 2 level. There was little use of connectives, embedding or subordination.

3. Findings in both oral language and oral reading seem to reflect a level of thinking which is a chain of thoughts rather than an integration of perceptions into a central idea or thought.

4. Quantitatively speaking the subjects could comprehend vocabulary at or beyond either their chronological age level or their mental age level, but were dependent on meanings of perceptual or functional nature normally used by 6 to 8 year olds.

5. The lag in the quality of word knowledge seems to reflect the criterial attributes selected for identification of the features of the physical world. The predominant attributes were of concrete orientation such as color, part-whole and size, again, typical of a 6 to 8 year old.

6. This inability to move beyond the concrete was also in

evidence in the area of conservation. Though concrete conservation was taking place, it appeared to be 1 to 2 years delayed and restricted by a perceptual bias. Attempts to conserve through story detail caused extreme difficulty. Lack of organization and fragmentation in the continuity of growth within this task seems to further indicate a lack of integration of information.

From the results obtained it is apparent that in the aspects of development examined there are delays in the emergence of ability and the acquisition of skills. These delays seem to be having an adverse affect on reading progress.

CHAPTER V

SUMMARY, CONCLUSIONS, AND EDUCATIONAL IMPLICATIONS

Reading is a composite task which requires the integration of experience through language and thought. Essential pre-requisites to such an undertaking include auditory and visual adequacy, precise perception and a sense of language. Such abilities simultaneously facilitate their own growth and the development of skill in the classification of experience, vocabulary and expressive language, concurrently cultivating the acquisition and assimilation of knowledge.

Disabled readers fail to maintain the same progress in reading as their peers. The findings reveal that the lack of reading progress seems to be due to deficiencies in skill areas which contribute to the reading process. In oral reading linguistic cue systems within the context were poorly utilized. Expressive language was extremely limited with word production falling into the first grade range and the maturity of the T-units at a Grade 2 level. Though quantity of vocabulary appeared to be at grade level or better the quality was of a perceptual, functional nature rather than conceptual. Both vocabulary and criterial properties were descriptive and definitive in the manner of 6 to 8 year olds. Conservation was delayed 1 to 2 years, appearing to have been impeded by a perceptual bias. Confined within the concrete world of a younger child and lacking an expressive tool the disabled learner is hindered in his reading progress.

CONCLUSIONS

Through this investigation explanation was sought for the lack of reading development in disabled learners. The particular questions posed are answered according to the findings.

Question 1: To what extent are syntactic and semantic cues employed in the reading task?

From the results of this study it appears that the children within this sample are unable to perceive syntax and semantics as an integral part of the reading process. They tended to function as a novice reader focusing on decoding [Smith's (1971) tunnel vision] and depending on prior text (Weber, 1970).

Two trends in the use of syntax were evident. One group tended to depend on preceding sentence text only, while the other group also made use of the whole passage. The latter group demonstrated fuller comprehension, though complete understanding was not guaranteed. In this sample there appeared to be a vague perception of the structure of language in which the inter-relationships were not utilized; the unit could not be subordinated to the thought (Denner, 1970).

Semantics seemed to cause greater difficulty for these individuals. Generally meaning was determined by the preceding text, otherwise the focus was on word identification. The sample seemed to be hampered by a lack of depth and breadth in their vocabulary, a vocabulary inadequately perceived and/or identified. Perhaps familiarity (Vernon, 1952) has not been established orally before employment in another framework, reading.

It is possible that both syntax and semantics are constrained by the channel capacity (Smith, 1971), that is, the amount of information which can be processed and that the tolerance level for noise (Smith), information which interferes with the acquisition of clear understanding, is low. This sample of children has not been able to assimilate the patterns of meaning and language sufficiently well from the milieu of oral language to be able to apply their knowledge to the reading code.

Question 2: What linguistic competencies are brought to the reading task in:
(a) word production?
(b) T-unit production?
(c) general language development disclosed through the use of connectives, embedding and subordination?

In the particular task administered word production was quite limited, falling into the lower Grade 1 range.

However, T-unit production appeared to be at a slightly higher level for most of the sample and fell within the Grade 2 range. Four subjects attained the Grade 5 level of T-unit maturity but this did not appear to correlate closely with better reading comprehension.

General language development corresponded with T-unit maturity. Morphological rules appeared to be understood but embedding and subordination were rarely used. The connectives deployed were those usually recognized at the Grade 2 level, with and used excessively.

The findings indicate that these disabled readers lack an adequate expressive tool. Their oral expression is delayed 2 to 3 years in its development, confirming the results of earlier research (Blank, 1972; Critchley, 1967; de Hirsch, 1962; Naidoo, 1972; Rabinovitch, 1968). It would seem that the kernel sentences represent a "chain of reasonings" (Vygotsky, 1962) rather than an interrelated whole, indicating that the capacity to abstract and think, that is, to represent and manipulate ideas symbolically has not emerged.

Question 3: How extensive is the vocabulary brought to the task?
(a) at what level is it understood?
(b) to what depth can it be explained?

The two aspects of vocabulary demonstrate the paradox which creates confusion for the disabled reader and those who work with him. His ability to understand exceeds his ability to express his knowledge, the latter appearing to correlate more closely with his capacity to think symbolically.

It was apparent that the development of the quantity of vocabulary corresponded with or was better than the expected growth for their chronological age or mental age. One may therefore assume that they do possess an adequate repertoire of words. However, the use of these words is restricted by a dependency upon meanings which reflect use and description, function or perceptual features, with little use of explanation or synonym. Such limited categorization is usually found in 6 to 8 year olds.

Since vocabulary development parallels closely the growth of expressive language, the question arises as to whether it is simply a lack of an expressive tool or a developmental lag in vocabulary growth.

Question 4: Upon which criterial attributes do the individuals depend in the process of identification and concept formation?

An examination of the criterial attributes used in describing the various cues revealed a dependency upon the perceptual properties.

The most favored attributes were 'color,' 'part-whole,' and 'size' with 'texture,' 'qualities,' and 'function,' likely to be used occasionally. Again, research (Bruner, 1966; Nixon, 1976; Siemens, 1973) has found this tendency to be characteristic of children in a younger age range (6 to 8 years) than those within this study (9 to 10 years).

It appears that this sample is bound by perceptual and functional characteristics which inhibit flexibility and impede transfer of knowledge.

Question 5: To what degree do these competencies reflect cognitive ability as revealed in the capacity to conserve concretely and abstractly?

From the findings of this study it would appear that the delays in the development of the competencies discussed above are a reflection of the stage of cognitive growth attained by the individuals within the sample.

In the area of concrete conservation a delay of 1 to 2 years in the acquisition of invariants of quantity was evident. The explanations offered in support of conservation tended to become more perceptually biased as the level of complexity increased and as concepts grew more remote.

When dependent upon a verbal presentation for the information to conserve the subjects experienced great difficulty, appearing to be unable to abstract and image the required detail. It seemed that neither the representation nor the organization of information was taking place. Perceptual bias was not evident in the Stories Conservation task, probably due to the absence of objects and/or inadequate representation.

Question 6: Is there a common pattern of growth apparent throughout the different areas of skill in the sample which would explain the lag in reading?

The common pattern of growth apparent throughout the sample was a delay in cognitive development and the various aspects of language. Bound by a concrete orientation towards experience and unable to communicate verbally, the children within this sample appear to be immature when compared with anticipated growth patterns.

For these individuals each experience is viewed separately. Labels are applied but appear to represent partial or indistinct concepts, perhaps due to insufficient décalage between the stages of knowing to establish familiarity. They are vaguely aware of what they perceive but left alone have difficulty determining essential distinguishing features and attributes. Lacking the essential tool for defining experience, for differentiating one feature from another, they are unable to either establish firm concepts or relate one idea to another. Such a language deficit interferes with the development of abstraction and categorization.

Their concrete orientation and segmentation of experience is evident in the limited range of criterial attributes, the absence of depth in vocabulary, and their primitive sentence construction. It seems that a restricted background of information is being brought to the reading task. If someone isolates each thought in his expressive language it seems doubtful that he can be expected to note interrelated details contained in many reading tasks. Some students do grasp the gist of the story, and fill in from their own experience but they often miss key changes in thought contained within both the spoken discourse and the printed message.

The findings seem to suggest that these students, though not of low intelligence, do not perform appropriately, rather they have a specific delay in both cognitive and linguistic ability not usually assessed by standard intelligence or language tests.

Though they may have been in an environment that supplied the necessary experience they were not ready to benefit from the opportunity and have not acquired many of the prerequisite skills for reading at later levels.

EDUCATIONAL IMPLICATIONS

The findings of this study may be pertinent to both clinical and classroom practice.

Since it appears that the various aspects of language provide background for reading, some consideration might be given in clinical practice to the assessment of the depth of vocabulary and maturity of expressive language. Some experimentation with the use of the general classification of meanings as in the manner of Feiffel and Lorge (1954) might be considered. Both oral and written language samples could be examined for T-unit maturity or for the general pattern of language development. It would seem that a clinic concerned with in-depth analysis has the ideal opportunity to develop and refine such tools while at the same time determining the quality of language development in current cases.

The relevance of the findings for the classroom lies in the recognition of the stage of cognitive growth attained by the disabled readers and the limitations it places upon him/her. Educators must be sensitive to the disabled learner in order to maximize his present understanding and at the same time facilitate his growth towards his potential.

Since movement along the continuum of cognitive development depends upon experience not age (Ausubel, 1963) it would seem advisable to program experiences designed specifically to facilitate the cognitive and linguistic growth of the disabled learner. Research (Soenstrom, 1966; Vygotsky, 1962; Wilkinson, 1971) supports the idea that through the use of language the child is able to move from the concrete implicit level of thinking to the abstract explicit level. In order to accomplish this he must have a vocabulary, representing many concepts, which are functionally a part of his expressive language.

The contrast in this study between the vocabulary known and that which is understood and explained reveals a discrepancy exists between the recognized words and the truly functional vocabulary. This should caution the educator to be aware that a word identified may not be a concept comprehended. Labels must be clearly identified with opportunity to discuss, to classify and reclassify according to a range of purposes.

Once these concepts have been established they can become tools which are used in various ways, both in appropriate and in inappropriate situations, further strengthening their identity. However they must also be inter-related with each other.

This basic problem is apparent among the learners in this study for they seem unable to integrate information. For most students this happens with little trauma but for the disabled learner this cannot be assumed to occur. Distinctive features, essential elements and comparisons and contrasts must be recognized and assimilated. Further their relevance to the language of other subjects (e.g. social studies) and to a variety of tasks (e.g. listening, speaking, reading and writing) also needs to be pinpointed in order to establish complete competency.

Research (see Chapter II) has revealed that the structural aspects of language are developmental and sequential. Structure begins with several simple basic sentences which are known and used prior to school entry. These are varied and altered through substitutions, expansions and transformations. Such modifications grow from experiences which create need for their varying forms. This sequential development has not always been incorporated into reading programs (Strickland, 1962; Cosens, 1974) but may need to be for certain learners.

In order to assist the disabled learner the teacher requires a knowledge of the structure of language. Not that it would be taught 'per se' but that by understanding the form of language the teacher could provide opportunities that would enable the child to develop his self expression in a sequential pattern. Through fine task analysis, perhaps in the manner of Gagné, the prerequisite skills could be determined so that the individual is always operating from a firm base rather than trying to identify components while performing the task.

Concomitant with such a task analysis would be the recognition of the décalage required to establish knowledge. It would seem that the more precise movement from exposure and awareness to specificity to generalization may require time lapses longer than normally anticipated. Such structure might eliminate the problem of information overload which appears extremely critical for this particular learner.

Although the school is limited in its capacity for one-to-one conversation between adult and child [the ideal way of developing language (Wilkinson, 1971)] it may be able to provide small group situations where individuals have a chance to share experiences orally, in discussion, in writing and in reading as well as listening to good literature.

The presentation of new concepts may best be accomplished through a very structured procedure which moves from awareness to distinctive features to identification to practice and application.

In order to vary the structure, it would seem that the disabled reader should also play and work with language much like a primary child. He needs to talk about what he does, how he does it and why he does it. In addition objectives for oral language may need to be in terms of individual development rather than in terms of comparison with students of the same age who are not handicapped by a developmental lag.

SUGGESTIONS FOR FURTHER RESEARCH

1. The present study could be replicated with a larger sample to determine if the results obtained represent a general trend.

2. The relationship of the T-unit maturity in oral language to reading comprehension could be examined at several grade levels.

3. A study could be made of the influence of purpose for language on oral expressions and its correlation with reading comprehension.

4. A study might be pursued which would compare the conservation and classification ability of normal and disabled readers to determine its relation to reading comprehension.

5. An exploration of the prerequisite skills for the acquisition of conservation of substance, or weight at the Grade 3 level.

6. A project to evolve procedures and sequence of reading materials for a junior age child functioning at an earlier cognitive level.

7. A project in programming syntax of language for the disabled reader.

8. A project to devise ways and means of developing vocabulary growth in disabled learners.

LIMITATIONS OF THE FINDINGS

1. Since this was a clinical study involving a few subjects, only trends, tendencies and patterns could be observed.

2. It should also be noted that there was no control for interest, motivation or attitudes.

3. This study was concerned with a particular type of learner and the trends observed relate specifically to that kind of learner.

CONCLUDING STATEMENT

Current testing procedures within the school system have not been able to pinpoint the particular difficulties encountered by the disabled reader. Though indicating certain deficiencies the information provided has not always been sufficiently diagnostic to serve as a basis for program planning in the classroom. Consequently an in-depth analysis of language, cognitive and reading skills was undertaken. The trends observed have provided some indication of the nature of the problems involved but further investigation is needed.

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APPENDICES

APPENDIX A

RESEARCH INSTRUMENTS: TASKS OF CONSERVATION WITH STORIES, CRITERIAL PROPERTIES, STORYTELLING, VOCABULARY AND ORAL READING

ADMINISTRATION OF THE TASKS

All the tasks used in the collection of the data are to be administered to each child individually. They are to understand that the purpose of the tasks is to discover how children learn and how this relates to their reading. They are to be encouraged to express their thinking, and assured in a positive manner.

The tasks are not to be rushed in order to allow the subjects adequate time to present their thoughts.

Record each session on tape and verify answers written by the examiner.

ORAL READING

Materials: 1 answer booklet of stories for each subject. (C for girls and D for boys.)

1 set of C stories

1 set of D stories

Directions: I am going to ask you to read some paragraphs aloud.

These stories you are going to read are about a girl/boy and her/his family. I want you to read carefully because when you have finished each story I am going to ask you some questions.

The stories will gradually get harder but watch and think carefully and you will be able to show how well you can read.

While you are reading I shall be writing on this paper. Don't worry about it because it is to help me understand how you read. I shall also have the tape recorder on. This is to help me too.

Now let's begin. Remember to do your best.

Here is the first story.

STORYTELLING

Materials: three pictures

1. the house in an electrical storm
2. a boy making a sandwich
3. Tom Sawyer receives a spanking

Directions: I would like you to tell a story about one of these pictures. You may choose whichever one you wish. While you tell your story the tape recorder will keep track of it. After you have finished you may listen to your story if you wish.

Now look at the pictures and decide which one you would like to tell a story about. When you are ready I will turn on the tape.

VOCABULARY

Peabody Picture Vocabulary Test

Materials: 1 copy of the book of pictures

1 copy of the answer sheet for each child

Directions: I have some pictures to show you. I want to find out how large your vocabulary is, that is, how many words you understand.

There are four pictures on each page. Each of them is numbered. I will say a word, then I want you to tell me the number of the picture which best tells the meaning of the word. Let us try one. Tell the number of the picture which best tells the meaning of "crib."

What number is "fin"?

What number is "butterfly"?

I am going to show you other pictures. Each time I say a word you tell me the number of the picture which best tells the meaning. As we work our way through the book you may not be sure of the meaning of the words, but I want you to look carefully at all the pictures anyway and choose the one you think is right.

What number is?

Stanford Binet Vocabulary Subtest

Materials: 1 answer sheet for each subject.

Directions: I want to find out how many words you know and understand. When I say a word you tell me what it means in the best way you can and in as many ways as you can. Explain what the word means to you.

While we talk the tape will record what we say. Don't forget to say clearly what you think the word means.

Alternate ways used to introduce the word.

What does . . . mean?

Tell me what a . . . is.

Just tell me in your own words, say it anyway you please. All I want to know is whether you know what a . . . is.

You know what a . . . is.

VOCABULARY

1. orange ______________________________
2. envelope ______________________________
3. straw ______________________________
4. puddle ______________________________
5. tap ______________________________
6. gown ______________________________
7. eyelash ______________________________
8. roar ______________________________
9. scorch ______________________________
10. muzzle ______________________________
11. haste ______________________________
12. lecture ______________________________

13. Mars ______________________________

____

14. skill ______________________________

____

15. juggler ______________________________

____

16. brunette ______________________________

____

17. peculiarity ______________________________

____

18. priceless ______________________________

____

19. regard ______________________________

____

20. disproportionate ______________________________

____

21. shrewd ______________________________

____

22. tolerate ______________________________

____

23. stave ______________________________

____

24. lotus ______________________________

____

25. bewail ______________________________

____

26. repose ______________________________

27. mosaic ______________________________

28. flaunt ______________________________

29. philanthropy ______________________________

30. ochre ______________________________

31. frustrate ______________________________

32. incrustation ______________________________

33. milksop ______________________________

34. harpy ______________________________

35. ambergris ______________________________

36. piscatorial ______________________________

37. depredation ______________________________

38. perfunctory ______________________________

39. limpet ____

____

40. achromatic ____

____

41. casuistry ____

____

42. homunculus ____

____

43. sudorific ____

____

TASK OF CRITERIAL PROPERTIES

Materials: one sun hat

one picture of a dog with a toy bone

card with auditory cue - horse

Directions: I am going to ask you to describe an object, a picture, and tell you the name of something to describe. Remember there are many things to tell about an object. Perhaps you will name it, give it a color, tell the size, shape or weight, tell its sound, taste, or action. You may want to tell what it is used for, what it feels like, where it lives, and what it is used for, what it feels like, where it lives, and what you like about it. You may describe the parts of the object, or you may remember that it is part of something else. The important thing is to say everything that you can about the object.

During the session prompting took the following forms:

You may pick it up and look at it.

Can you tell me more about it?

Is there anything else you would like to tell about it?

TASKS OF CONCRETE CONSERVATION

Prior to each session establish the three stations as follows:

Station 1	2 balls of plasticine
	balance scales
	one glass of water
	2 display cards
Station 2	2 balls of plasticine
	a cutting board
	a knife
	2 glasses of water
	2 display cards
Station 3	2 glasses of water
	4 sugar cubes
	2 display cards

At the beginning of the session have the subjects establish that the balls of clay are equal by weighing them.

After each decision ask the following questions:

1. Why is that?
2. How did you know that?

Station 1. E. What do you see on these cards?

Are they equal?

How did you check?

Now I will change one of them a little bit.
(Examiner makes one ball into a doughnut.)

ASK TEST ITEMS 1 AND 2. (See check sheet following.)

Here is a glass of water.

ASK TEST ITEM 3.

Station 2. E. Here are two more balls of plasticine. Are they equal? How did you check?

Now we are going to change their shape. Which would you rather do, make a snake or cut it into cubes?

(The snake was then placed on one show card and the cubes on the other show card within a 4" square area.)

ASK TEST ITEMS 4 AND 5.

Now would you check that the weight of these glasses of water are equal and the level of the water in them is exactly the same.

ASK TEST ITEM 6.

Station 3. E. Let's check the weight of the water to make sure they are equal. Let's also check the level of water.

ASK TEST ITEMS 7, 8, AND 9.

CONCRETE TASKS OF CONSERVATION

	Decision	Explanation
Level of complexity I—deformation of one of 2 balls.		
Test item 1: Conservation of substance		
Is there more plasticine in the "doughnut" than in the ball? Or is there less? Or is there the same amount of plasticine in the "doughnut" as there is in the ball? (Pointing)		
Test item 2: Conservation of weight		
Suppose we put the "doughnut" in one pan of the scale and the ball on the other pan of the balance scale, would the ball weigh less, or the same, or more than the "doughnut"?		
Test item 3: Conservation of volume		
If I drop this ball of plasticine into this glass of water, what will happen?		
What else will happen?		
(The ball is placed in water . . . elastic band adjusted to water level. Ball removed and returned to support. Ball and doughnut covered.)		
If I put this "doughnut" into this glass of water, will the level of water be the same as it is in this glass of water in which I put the ball? Or will it be lower, or will it be higher?		

	Decision	Explanation
Level of Complexity II—deformation of each object to a snake and small cubes of plasticine.		
Test item 4: Conservation of substance Is there the same amount of plasticine in the snake as the pieces (point) or is there more in the pieces or is there less plasticine in the pieces?		
Test item 5: Conservation of weight If we put this snake on the pan of the scale and the pieces on this pan, will the pieces weigh less than the snake, or the same as the snake, or more than the snake?		
Test item 6: Conservation of volume (2 glasses containing water are presented on two supports. The weight of the glasses of water and the levels of water are determined as being equal. Snake and cubes are covered.) Suppose we put the snake into this glass of water (point) and the cubes into this glass of water (point), will the level of water go higher for the snake or the pieces? Or will the level be lower for the snake? Or will the level be the same for both?		

	Decision	Explanation
Level of Complexity III—2 glasses, weight and level of water in each glass determined.		
Suppose I put these sugar cubes into the glass of water, what will happen?		
What else will happen?		
(Sugar cubes are put into water. Subject marks the level of water with an elastic band.)		
What is happening to the sugar?		
What has happened to the water level?		
Suppose we put each of these glasses on the balance scale now. Will the sugar water weigh more, or will it weigh less, or will it weigh the same as the pure water?		
Why is that?		
Test item 7: Conservation of substance		
If we come back tomorrow, will there be a sweet taste left in this water?		
Test item 8: Conservation of weight		
Tomorrow, when we come back, suppose we put this glass of sweet water on one pan and the glass of pure water on the other pan of the balance scale, will this glass of sweet water be heavier or will it be lighter, or will it be the same weight as the pure water?		
Test item 9: Conservation of volume		
Tomorrow will the level of the sweet water be higher than the level of the pure water or will it be the same level or will it be lower?		

THE FUNNY RACE AT THE PICNIC

The grade four class invented a "funny" race for their picnic. They chose six boys to be in the race. Each boy was to carry a ball of wax and walk as fast as he could to the finish line. Every boy was given a ball with just the same amount of wax in it. That was only fair.

It was certainly a funny race. The boys lined up and each stood there with his round ball of wax, every ball the same size. But it was a very hot day. The wax got softer and softer. It started to run down between their fingers. It began to go into funny shapes.

Now the rule was, "No wax is to fall on the ground." So the boys had to act fast. One boy rolled his wax around and around his two fists, like a muff. Another boy made his wax flat like a pancake and stuck it on top of his head. Another rolled his wax into a couple of doughnuts and stuck his fists through them. One boy squeezed his wax so hard it shot up through his fingers like a jack-in-the-box. The boy on the end of the line had a funny one. It had long legs and looked like a little old man on stilts.

It was lucky there was a picnic table handy. The boys put their funny wax figures on the table so everyone could see them.

Then the arguments started. Some children said the boy with two doughnuts ended up with more wax than anyone else. Others said that the boy who put the pancake on his head had the lightest load to carry. Some said the boy with the muff had brought back the most wax of all, because it was so thick. Another said the jack-in-the-box was funny, they liked it best, as it was the biggest and the heaviest. One said the little man on stilts was the best because it was lightest of all.

What do you think?

JIMMY FEEDS THE BIRDS

Jimmy lived in a cabin on the side of a mountain. The snow was very deep in winter and the days were short. He could see the birds and other wild animals hunting for food in the woods as he walked home from school. The birds came into the clearing around the cabin to look for food and he could watch them as he ate his own meals.

Jimmy decided to make feeding stations for the birds and set out food for them. The chickadees and sparrows and Canada jays would like suet. They needed the fat to keep them warm and suet was good solid fat.

Jimmy took a large chunk of suet and carefully cut it into three equal pieces. He took one solid piece outside and nailed it high up on the trunk of a tree for the chickadees. He chopped one piece up into very tiny bits and put them on top of an old stump for the sparrows. The third piece he cut into middle sized chunks. He swept a place clear of snow and put all the chunks on the ground for the jays.

Jimmy stood in the door of the cabin and looked at what he had set out for the birds.

"Now that's a funny thing," he said to himself.

"I start out with three whole pieces the very same and just look at them now! One's still a big piece. Another is a few chunks. And the other is just a lot of little bits."

"Will the sparrows have as much to eat as the chickadees?" he wondered.

Suddenly Jimmy remembered his pet crow. Now the crow would like some of Jimmy's popcorn. There was only a cupful of seeds left. So Jimmy measured half a cup of seeds for his pet crow, and kept half a cup for himself. He put the seeds for the crow in a bowl and set the bowl under the porch so that the snow would not cover the seeds.

That night Jimmy's mother popped the corn that he had saved for himself. You know what happened. Jimmy had three bowls of popcorn!

And, of course, Jimmy wondered again if his crow had as much food to eat as he had!

TASK OF STORIES CONSERVATION

Directions. Today I am going to play a tape with some stories on it. We will listen to each story, following which I will ask you some questions to be sure you understand it. After this discussion I will ask you about some other ideas in the story. Then you can show me how much you know and understand about things around us.

Now let's listen to the first story.

Ask the following preliminary questions prior to the test items.

This was a funny story wasn't it?

What did the boys make with the soft balls of wax?

What else did they make? Why was the wax soft?

How did they divide the wax among the boys? Why was that?

What was the rule about the wax for this race?

Why did they make that rule?

Where did the boys put their funny figures at the end of the race?

ASK TEST ITEMS 1 TO 5

Now it's time to listen to another story.

Ask the following preliminary questions before the test items.

Jimmy decides to feed the suet to the birds around the cabin. What kind of birds is he feeding?

Jimmy starts off with one big piece of suet. What does he do with this big piece?

Now he has three pieces of suet. What are they like?

So Jimmy has three equal pieces of suet. Why does he make them equal?

Jimmy gives one of these pieces to the chickadees. How does he fix it for the chickadees?

He gives one of them to the jays. How does he fix it for the jays?

How does he fix the piece for the sparrows?

Jimmy fed his pet crow some popcorn seeds. How much popcorn seed did he feed the crow? How much did he keep for himself?

ASK TEST ITEMS 6 TO 7.

Test items: levelof complexity I

Decision	Explanation

Three test items at level of complexity I are based on the deformation of one object with the substance remaining continuous. The deformation is described as part of the story situation.

Test item I, Conservation of substance

One boy changed the ball of wax he started out with into two doughnuts. Was there more wax in the two doughnuts than in the ball, or was there the same amount or was there less wax?

Test item II, Conservation of weight

One of the boys rolled his ball of wax round and round his two fists like a muff. Would this muff be the same weight as the ball, or was it heavier or was it lighter?

Test item III, Conservation of volume

Suppose we put the two doughnuts the boy made from his ball of wax into half a bowl of water and mark the level the water comes up to (gesture). Then suppose we take the doughnuts out of the water (gesture) and put the muff the boy made from his ball into the water (gesture). Will the level of the water be higher for the doughnuts than for the muff or will the water levels be the same for both, or will the level be lower for the doughnuts?

Test items: level of complexity II	Decision	Explanation
Three test items at level of complexity II are based on one deformation of each of two subjects.		
Test item IV, Conservation of substance You remember the one that looked like a little old man on stilts. Would this little man have the same amount of wax in it as the muff, or would it have less wax or would it have more wax?	1	
Test item V, Conservation of weight Was the pancake lighter than the jack-in-the-box, or was it the same weight or was the pancake heavier than the jack-in-the-box?		
Test item VI, Conservation of volume Story II Jimmy has two cardboard boxes the very same size and shape. The solid piece of suet he fixed for the chickadees fills one of these boxes exactly. If he packs the little pieces for the sparrows into the other box, will the box be full, or will it be partly filled, or will he need an extra box to hold these pieces?		

Test items: level of complexity III

Decision	Explanation

Test items at level of complexity III, based on the Story II, involve two deformations of each of two objects.

Test item VII, Conservation of substance

Did Jimmy give the jays as much suet to eat as the sparrows, or did the jays get more, or less suet to eat than the sparrows?

Test item VIII, Conservation of weight

Jimmy cut one of the pieces of suet into big chunks and put these big chunks out for the jays. Will these chunks be heavier than the suet he cut into small pieces for the sparrows, or will they be the same weight, or will they be lighter?

Test item IX, Conservation of weight

You remember Jimmy gave his pet crow the popcorn seeds and he had the popcorn! Did the crow have as much "food" to eat as Jimmy, or did it have more food, or did it have less food?

APPENDIX B

INSTRUMENTS FOR ANALYSIS OF ORAL READING MISCUES, VOCABULARY, AND CRITERIAL PROPERTIES

MODIFIED SYNTACTIC PROXIMITY

0 Observed response and expected response are unrelated or have little in common.

1 Observed response retains key syntactic function of expected response.

2 Major change in syntax by word change, intonation or phrase structure change.

3 Change in person, tense, number in observed response.

4 Change in function word.

5 No change in observed response from expected response.

SYNTACTIC ACCEPTABILITY

1 Not acceptable

2 Acceptable with beginning of sentence

3 Acceptable with end of sentence

4 Acceptable with sentence

5 Acceptable with total passage

MODIFIED SEMANTIC PROXIMITY

0	Meaning of observed response and expected response unrelated or vaguely related.
1	Appropriate response but unrelated to context.
2	Change in meaning through association, intonation or use of only prior or subsequent text.
3	Use of antonym.
4	Slight change in meaning through connotation or substitution.
5	Synonym.
6	No change.

SEMANTIC ACCEPTABILITY

1	Bizarre
2	Not acceptable, not bizarre
3	Acceptable with beginning of sentence
3	Acceptable with end of sentence
4	Acceptable with sentence
5	Acceptable with passage

FEIFFEL AND LORGE QUANTITATIVE ANALYSIS

Synonym Category

(a) Synonym unmodified:	Orange = a fruit
(b) Synonym modified by use:	Straw = hay that cattle eat
(c) Synonym modified by description:	Gown = long dress
(d) Synonym modified by use and description:	Eyelash = hair over the eye that protects you
(e) Synonym qualified as to degree:	Tap = touch lightly

Use, Description, and Use and Description Category

(a) Use:	Orange = you eat it
(b) Description:	Straw = it's yellow
(c) Use and Description:	Orange = you eat it and its round

Explanation Category

(a) Explanation:	Priceless = it's worth a lot of money Skill = being able to do something well

Demonstration, Repetition, Illustration and Inferior Explanation Category

(a) Demonstration:	For words like tap, eyelash, etc.
(b) Repetition:	Puddle = a puddle of water
(c) Illustration:	Priceless = a gem
(d) Inferior Explanation:	Scorch = hot

Error Category

(Incorrect Demonstration, Misinterpretation, Wrong Definition, Clang Association, Repetition without Explanation, Omits)

(a) Incorrect Demonstration:	Eyelash = points to eyebrow
(b) Misinterpretation:	Regard = protects something
(c) Wrong Definition:	Orange = a vegetable
(d) Clang Association:	Roar = raw; skill = skillet
(e) Repetition without Explanation:	Puddle = puddle
(f) Omits:	When the word is left out

SIEMEN'S CATEGORIES OF MEANING

Categories of Meaning	Hat	Dog	Horse
Color			
Shape			
Size			
Texture			
Composition			
Weight			
Taste			
Smell			
Sound			
Actions			
Qualities			
Use			
Function			
Part-whole			
Where it lives			
Class names or others of same class			
Connotation			
Variety of contexts			
Synonym			
Concept of which it is a part			